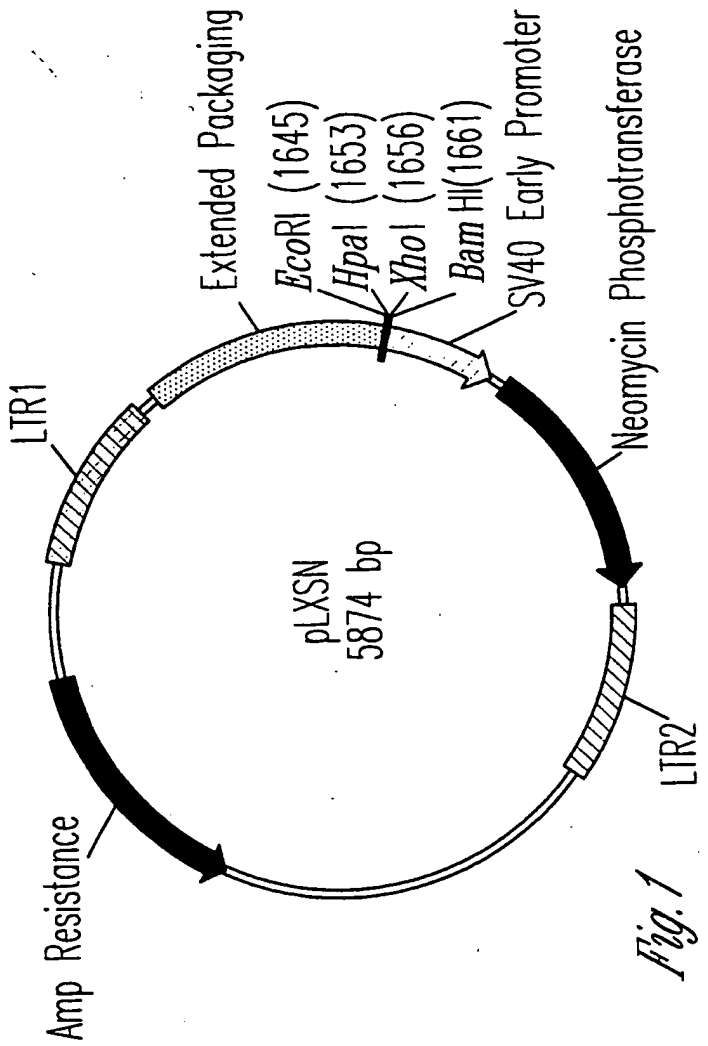

Extended Packaging
EcoRI (1645)
HpaI (1653)
XhoI (1656)
BamHI(1661)
SV40 Early Promoter
Neomycin Phosphotransferase
LTR1
pLXSN
5874 bp
LTR2
Amp Resistance

Fig. 1

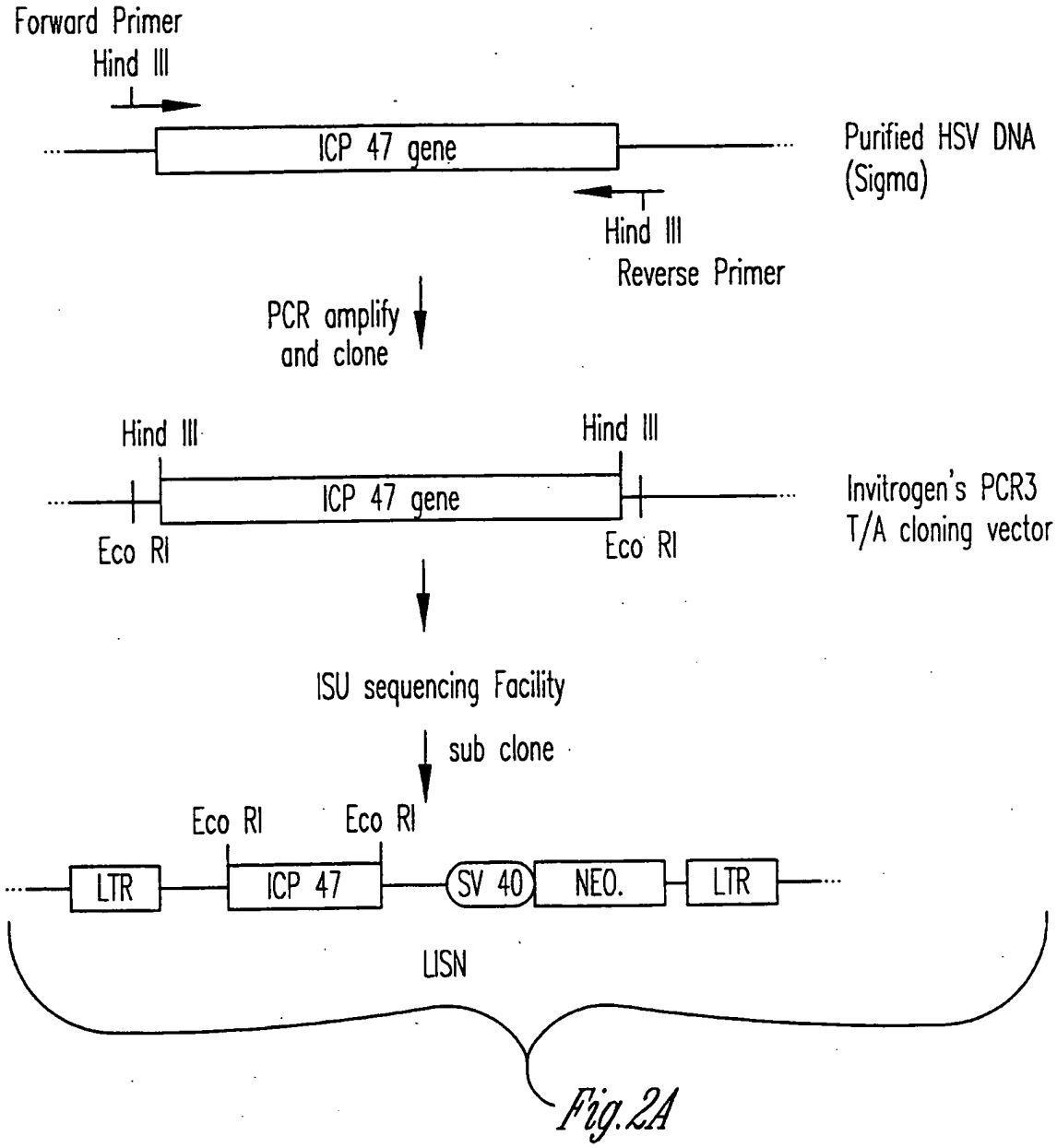

Forward Primer
Hind III
ICP 47 gene
Purified HSV DNA
(Sigma)
Hind III
Reverse Primer
PCR amplify
and clone
Hind III
Hind III
ICP 47 gene
Invitrogen's PCR3
T/A cloning vector
Eco RI
Eco RI
ISU sequencing Facility
sub clone
Eco RI
Eco RI
LTR
ICP 47
SV 40
NEO.
LTR
LISN

Fig.2A

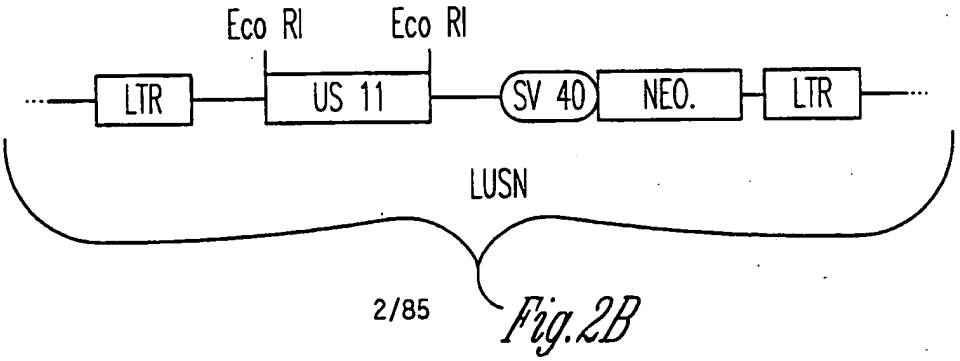

Eco RI
Eco RI
LTR
US 11
SV 40
NEO.
LTR
LUSN

Fig.2B

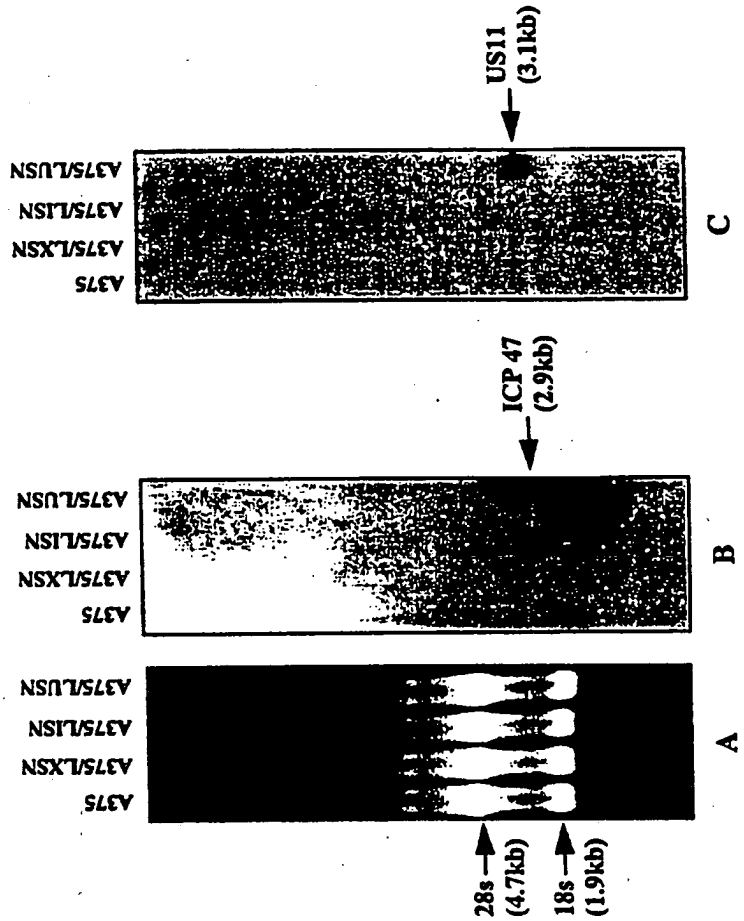

US11
(3.1kb)
A37S/LUSN
A37S/LISN
A37S/LXSN
A37S
C
ICP 47
(2.9kb)
A37S/LUSN
A37S/LISN
A37S/LXSN
A37S
B
A37S/LUSN
A37S/LISN
A37S/LXSN
A37S
A
28s
(4.7kb)
18s
(1.9kb)

Fig. 3

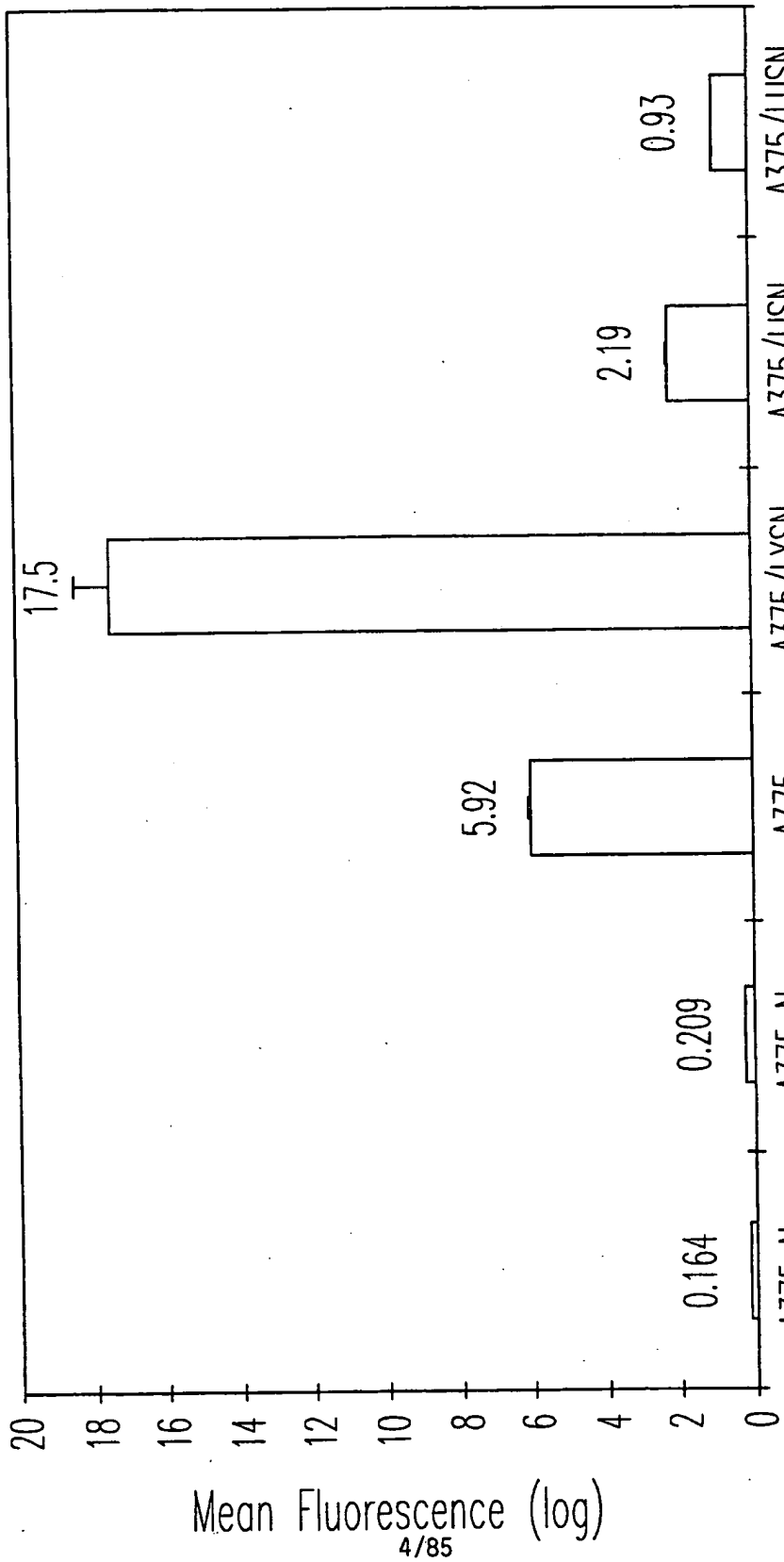

Mean Fluorescence (log)
0
2
4
6
8
10
12
14
16
18
20
0.164
0.209
5.92
17.5
2.19
0.93
A375 No Ab
A375 No Primary
A375
A375/LXSN
A375/LISN
A375/LUSN
Cell Line

Fig. 4

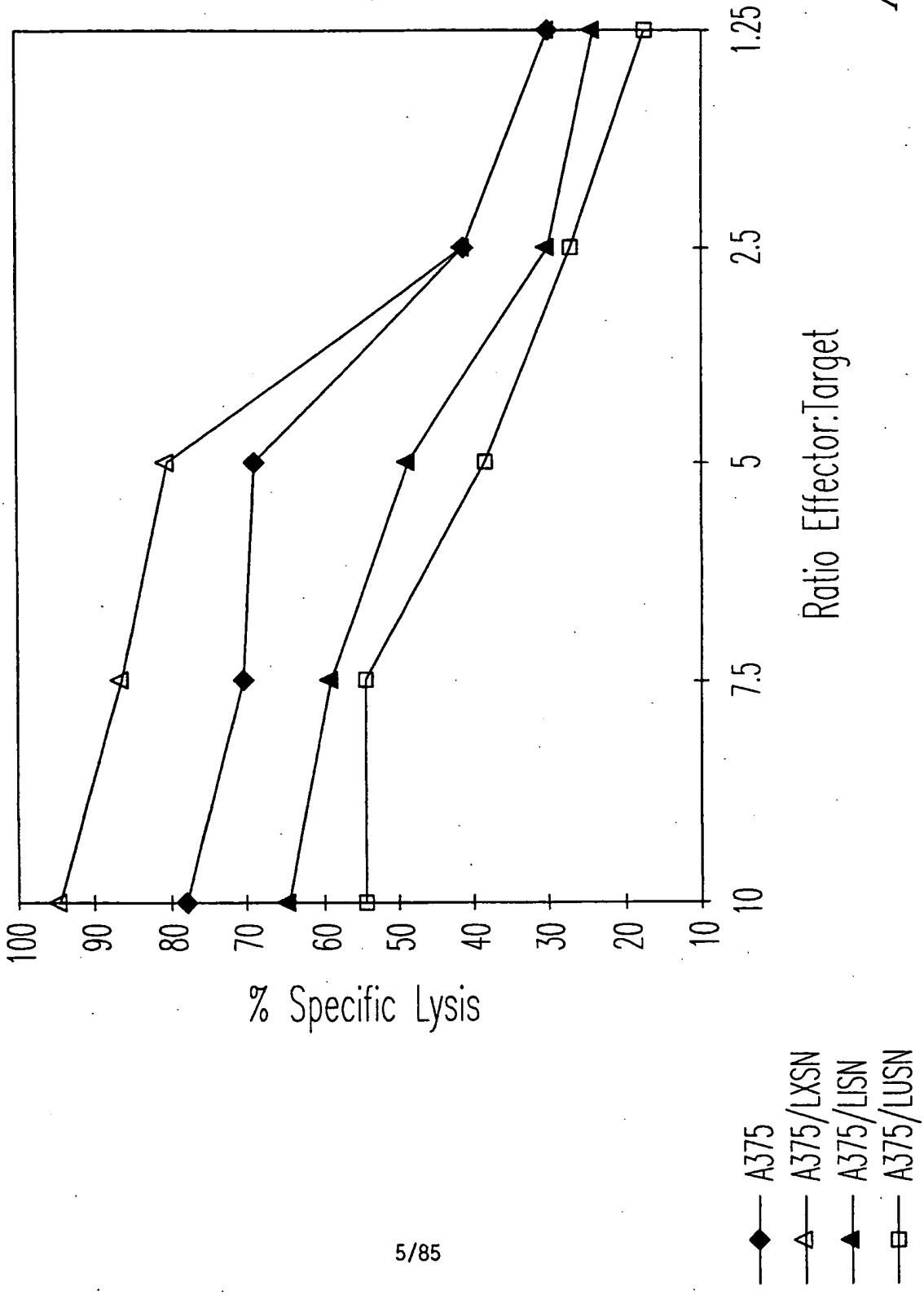

100
90
80
70
60
50
40
30
20
10
% Specific Lysis
10
7.5
5
2.5
1.25
Ratio Effector:Target
A375
A375/LXSN
A375/LISN
A375/LUSN

Fig. 5

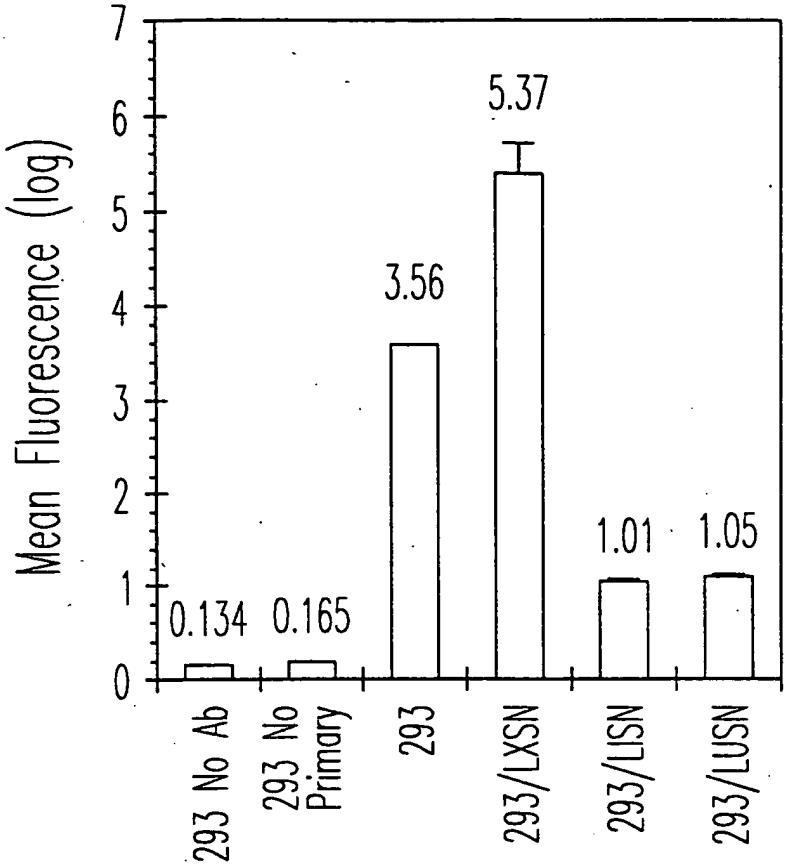

Mean Fluorescence (log)
0
1
2
3
4
5
6
7
0.134
0.165
3.56
5.37
1.01
1.05
293 No Ab
293 No Primary
293
293/LXSN
293/LISN
293/LUSN

Fig. 6A

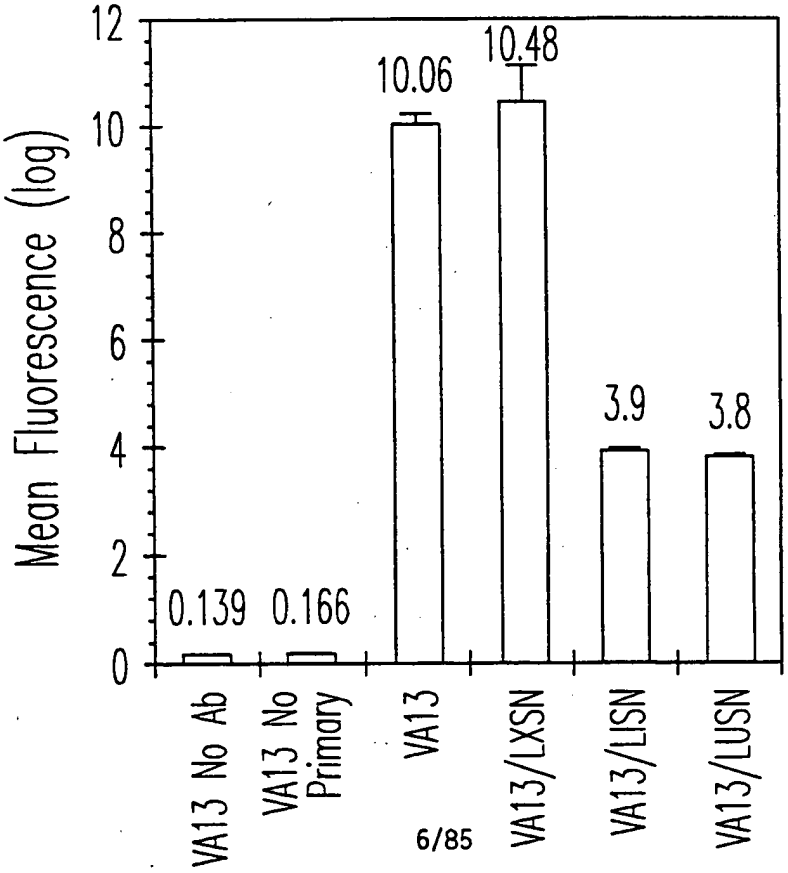

Mean Fluorescence (log)
0
2
4
6
8
10
12
0.139
0.166
10.06
10.48
3.9
3.8
VA13 No Ab
VA13 No Primary
VA13
VA13/LXSN
VA13/LISN
VA13/LUSN

Fig. 6B

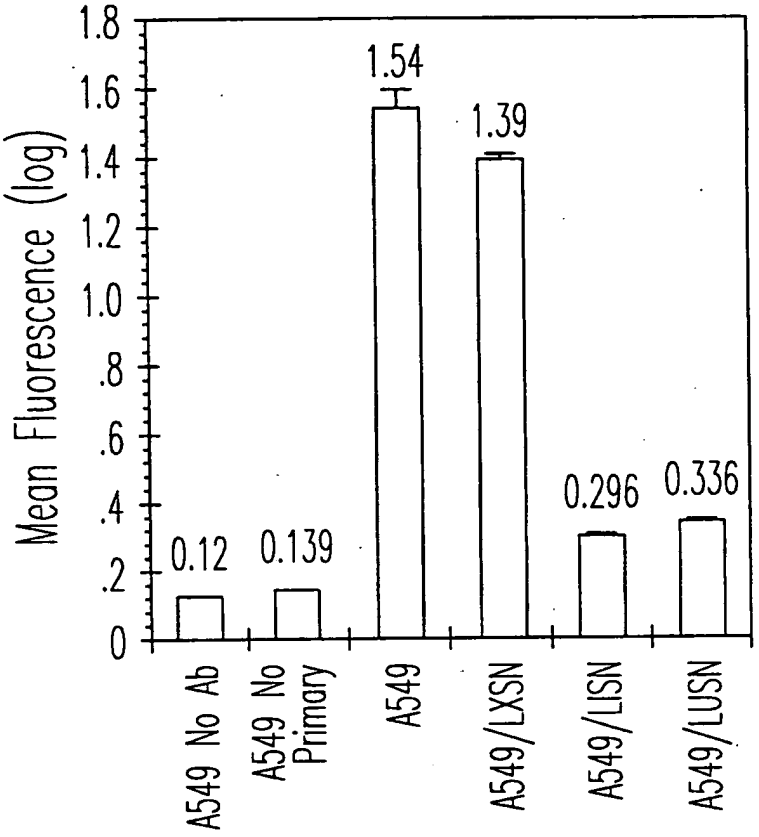

Mean Fluorescence (log)
1.8
1.6
1.4
1.2
1.0
.8
.6
.4
.2
0
1.54
1.39
0.12
0.139
0.296
0.336
A549 No Ab
A549 No Primary
A549
A549/LXSN
A549/LISN
A549/LUSN

Fig. 6C

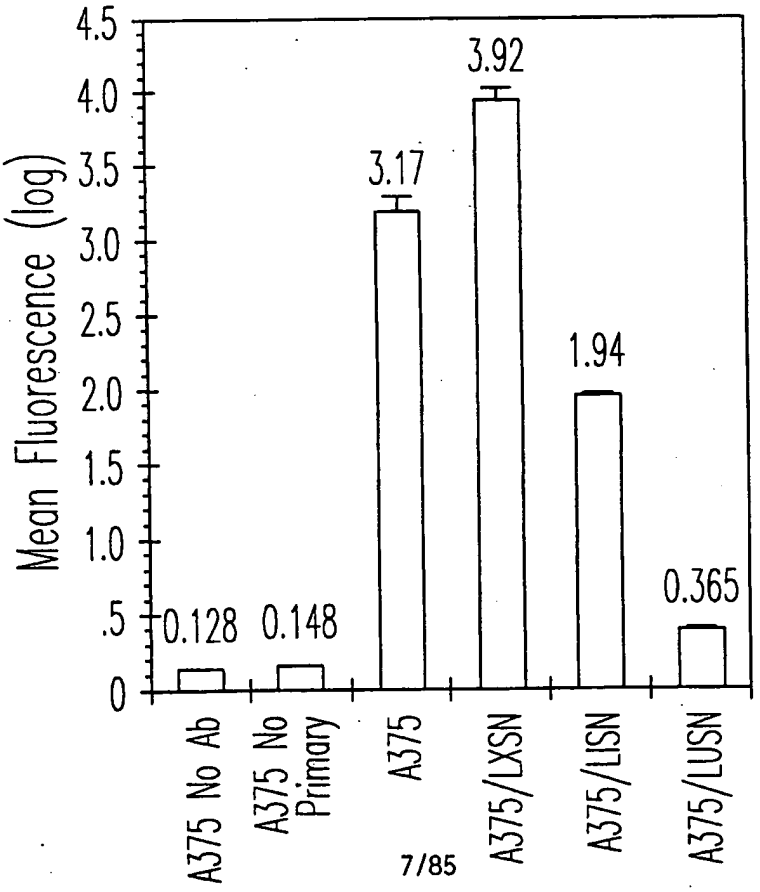
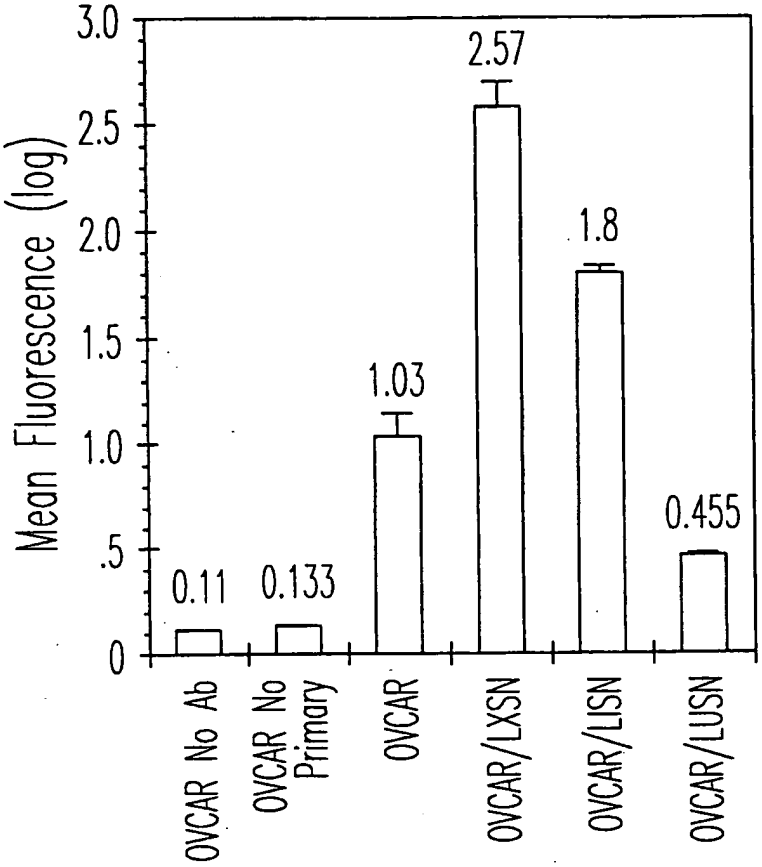

Mean Fluorescence (log)
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
.5
0
3.92
3.17
1.94
0.365
0.128
0.148
A375 No Ab
A375 No Primary
A375
A375/LXSN
A375/LISN
A375/LUSN

Fig. 6D


Mean Fluorescence (log)
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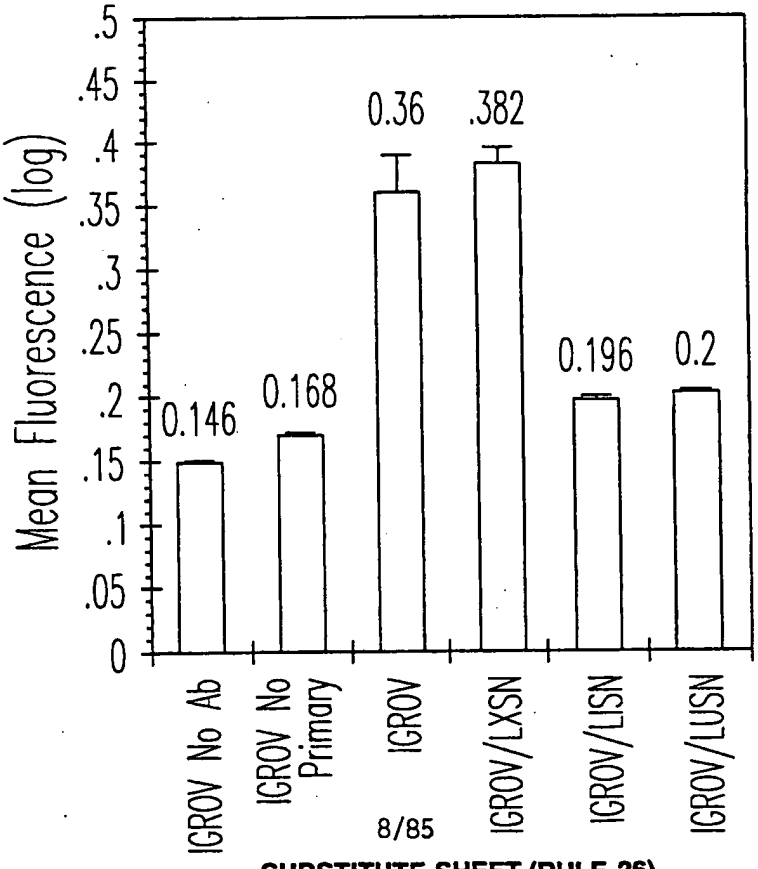
2.5
2.0
1.5
1.0
.5
0
0.11
0.133
1.03
2.57
1.8
0.455
OVCAR No Ab
OVCAR No Primary
OVCAR
OVCAR/LXSN
OVCAR/LISN
OVCAR/LUSN

Fig. 6E


Mean Fluorescence (log)
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.45
.4
.35
.3
.25
.2
.15
.1
.05
0
0.146
0.168
0.36
.382
0.196
0.2
IGROV No Ab
IGROV No Primary
IGROV
IGROV/LXSN
IGROV/LISN
IGROV/LUSN

Fig. 6F

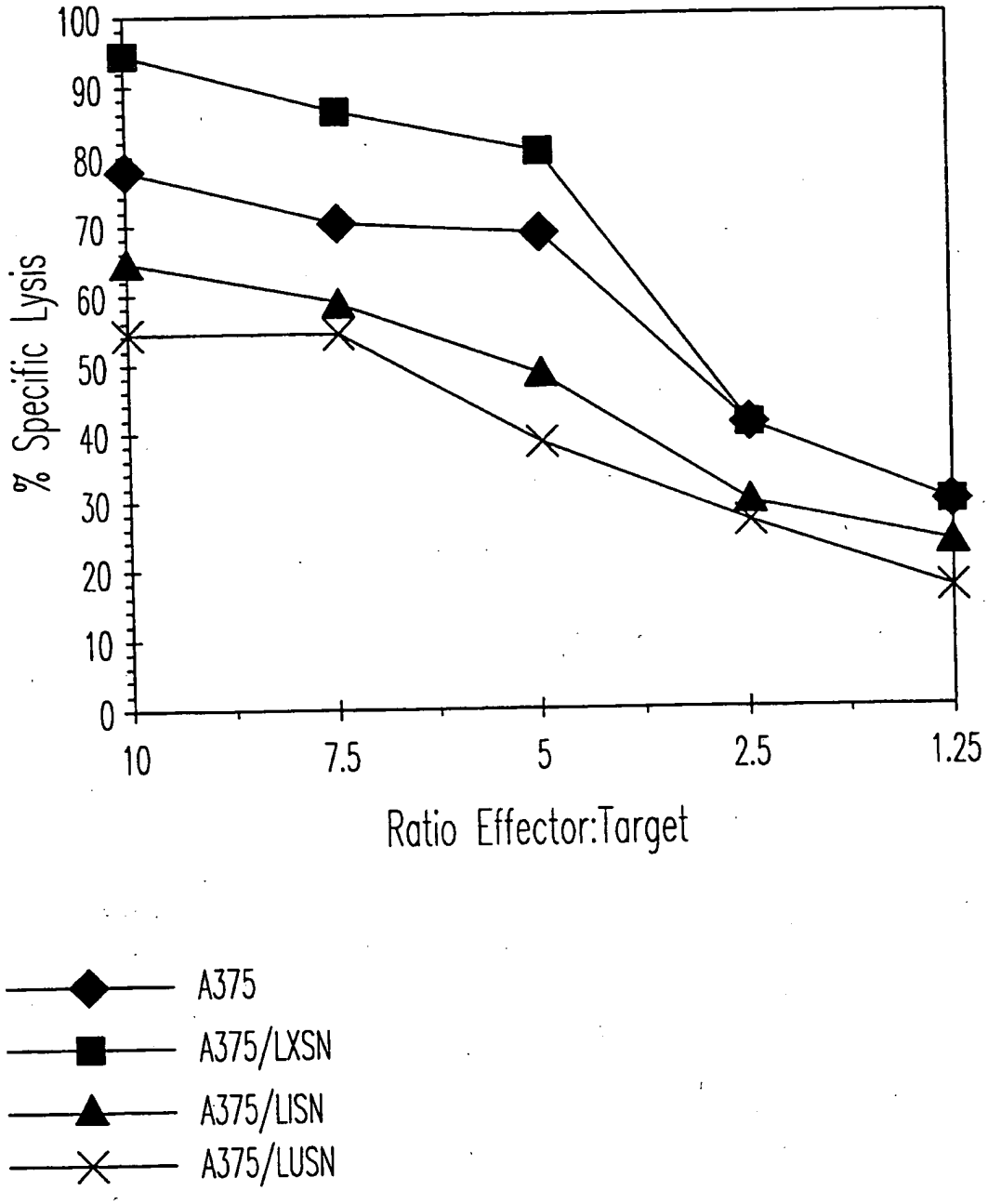
100
90
80
70
60
50
40
30
20
10
0
% Specific Lysis
10
7.5
5
2.5
1.25
Ratio Effector:Target
A375
A375/LXSN
A375/LISN
A375/LUSN

Fig. 7A

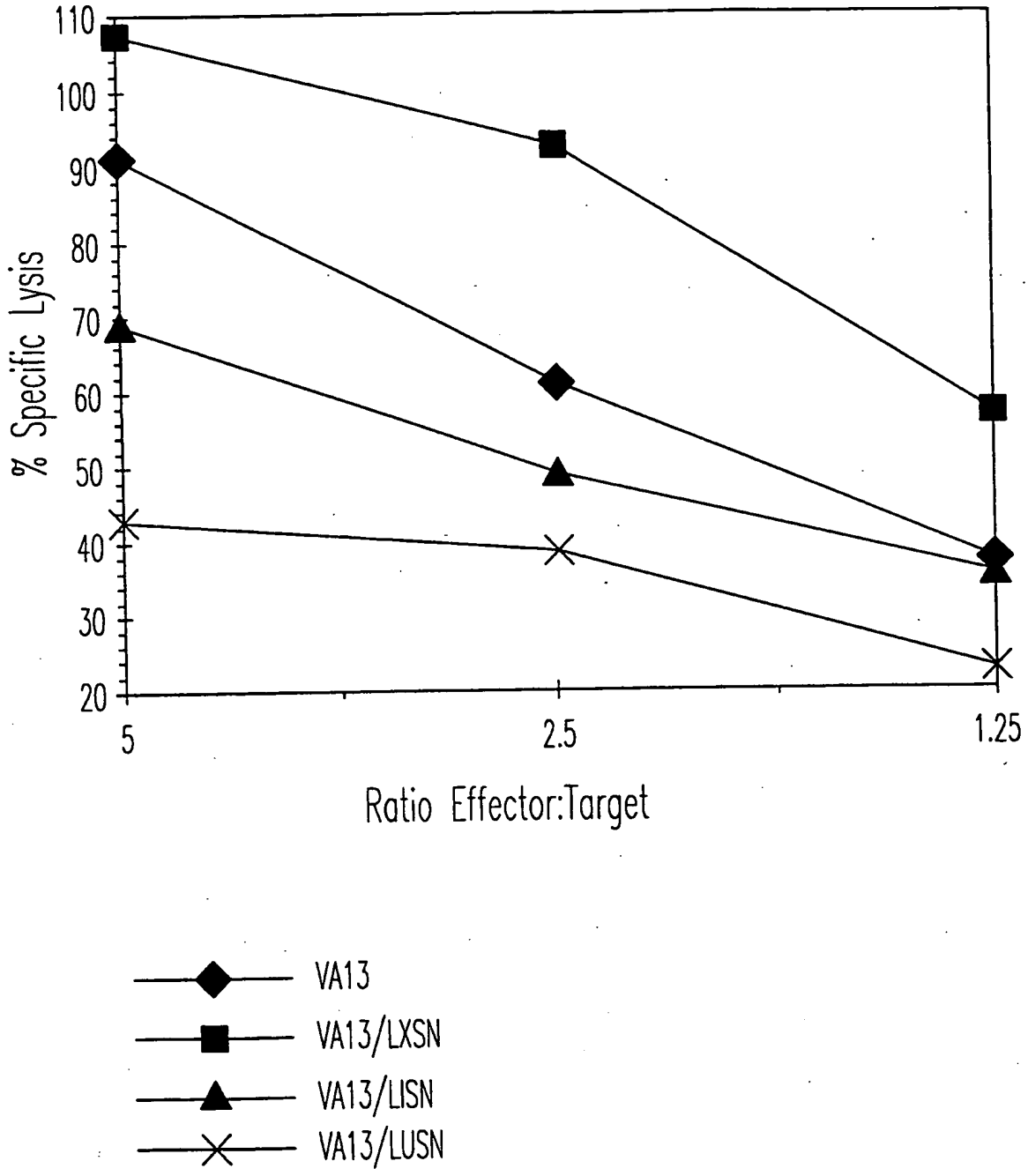
110
100
90
80
70
60
50
40
30
20
% Specific Lysis
5
2.5
1.25
Ratio Effector:Target
VA13
VA13/LXSN
VA13/LISN
VA13/LUSN

Fig. 7B

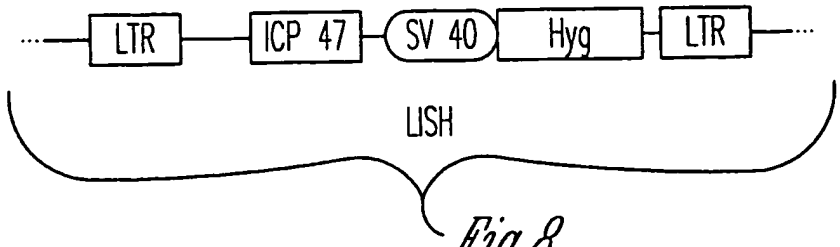

Fig. 8

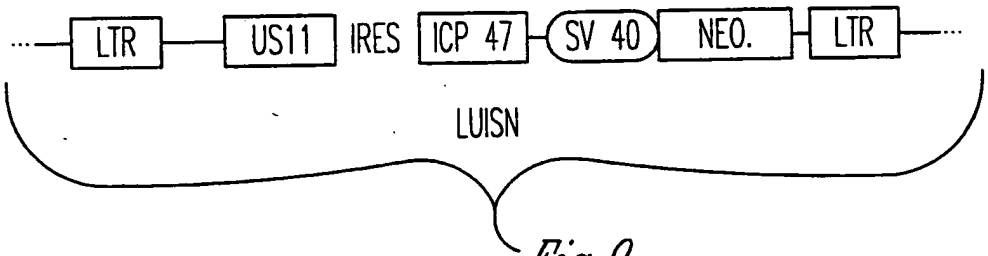

Fig. 9

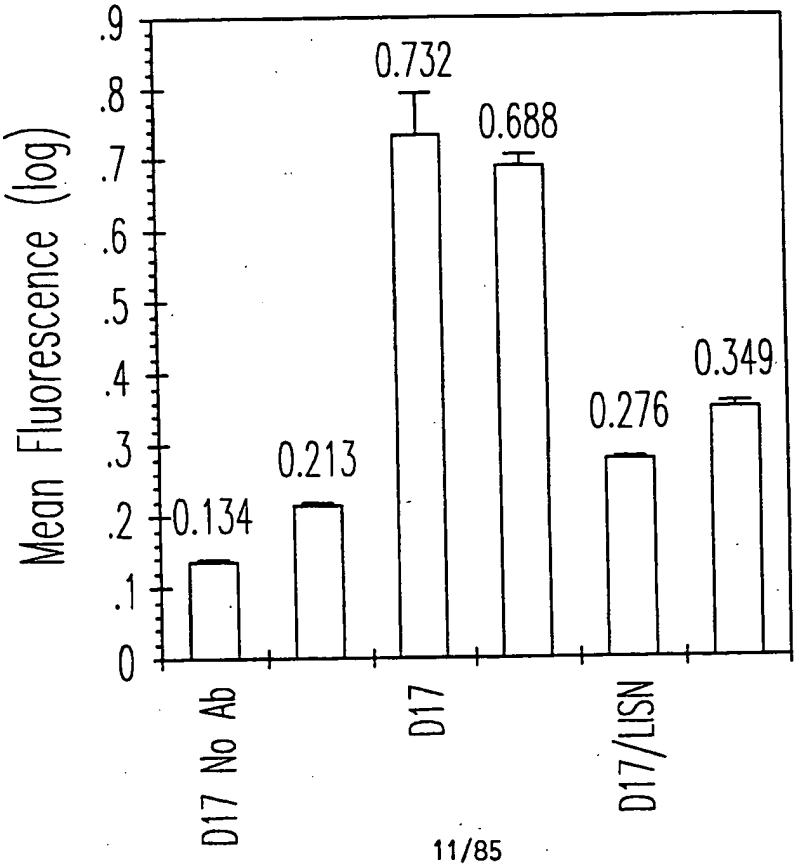

Fig. 10A

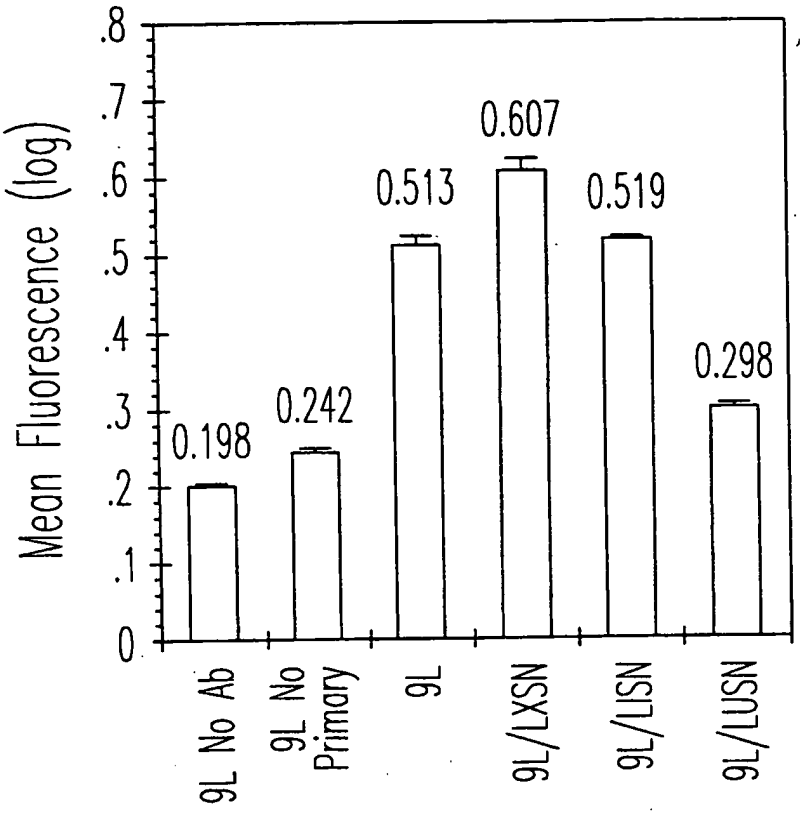

Fig. 10B

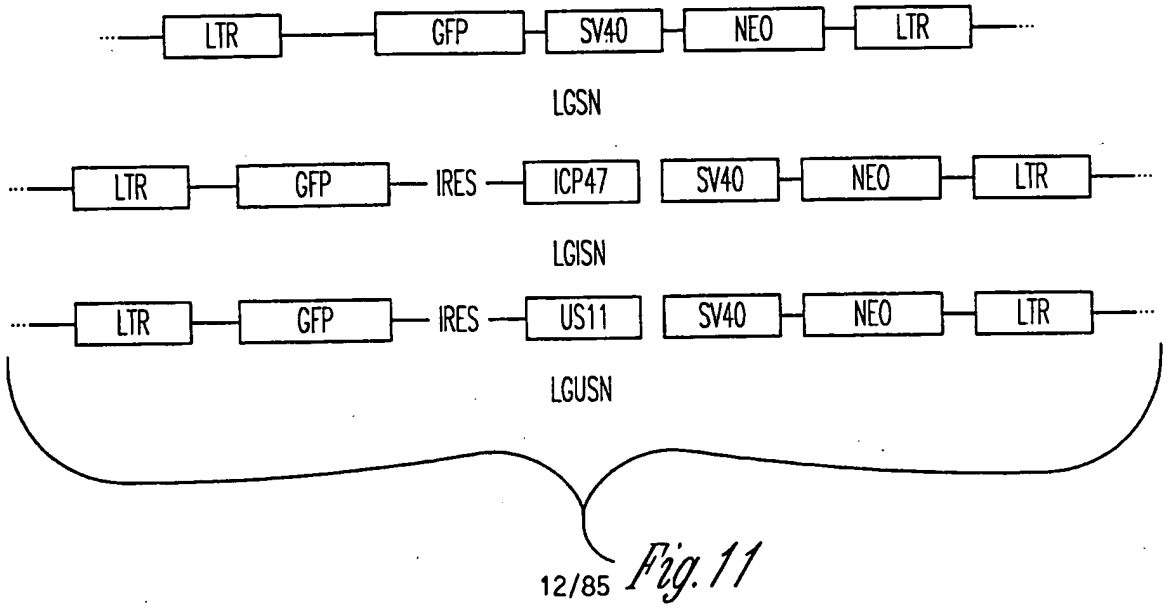

Fig. 11

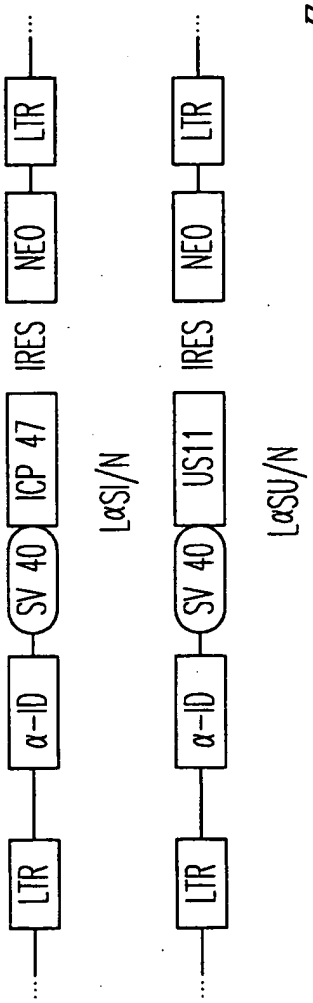
LTR
α-ID
SV 40
ICP 47
IRES
NEO
LTR
LαSI/N
LTR
α-ID
SV 40
US11
IRES
NEO
LTR
LαSU/N

Fig. 12

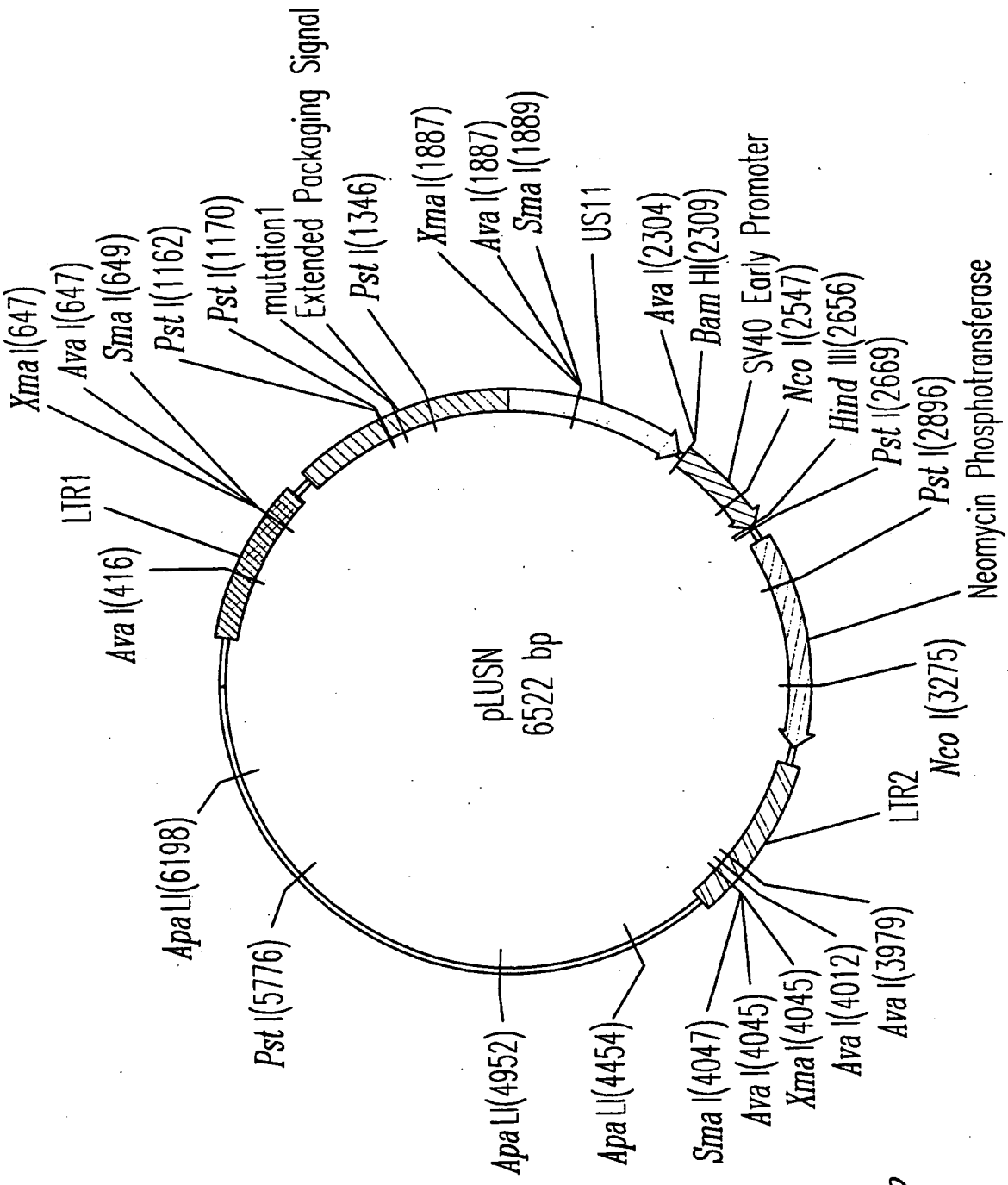
pLUSN
6522 bp
LTR1
Xma I(647)
Ava I(647)
Sma I(649)
Pst I(1162)
Pst I(1170)
mutation1
Extended Packaging Signal
Pst I(1346)
Xma I(1887)
Ava I(1887)
Sma I(1889)
US11
Ava I(2304)
Bam HI(2309)
SV40 Early Promoter
Nco I(2547)
Hind III(2656)
Pst I(2669)
Pst I(2896)
Neomycin Phosphotransferase
Nco I(3275)
LTR2
Ava I(3979)
Ava I(4012)
Xma I(4045)
Ava I(4045)
Sma I(4047)
Apa LI(4454)
Apa LI(4952)
Pst I(5776)
Apa LI(6198)
Ava I(416)

Fig. 13

```
   1 GAATTGCTAG CAATTGCTAG CAATTGCTAG CAATTCATAC CAGATCACCG
     CTTAACGATC GTTAACGATC GTTAACGATC GTTAAGTATG GTCTAGTGGC

  51 AAAACTGTCC TCCAAATGTG TCCCCCTCAC ACTCCCAAAT TCGCGGGCTT
     TTTTGACAGG AGGTTTACAC AGGGGGAGTG TGAGGGTTTA AGCGCCCGAA

 101 CTGCCTCTTA GACCACTCTA CCCTATTCCC CACACTCACC GGAGCCAAAG
     GACGGAGAAT CTGGTGAGAT GGGATAAGGG GTGTGAGTGG CCTCGGTTTC

 151 CCGCGGCCCT TCCGTTTCTT TGCTTTTGAA AGACCCCACC CGTAGGTGGC
     GGCGCCGGGA AGGCAAAGAA ACGAAAACTT TCTGGGGTGG GCATCCACCG

 201 AAGCTAGCTT AAGTAACGCC ACTTTGCAAG GCATGGAAAA ATACATAACT
     TTCGATCGAA TTCATTGCGG TGAAACGTTC CGTACCTTTT TATGTATTGA

 251 GAGAATAGAA AAGTTCAGAT CAAGGTCAGG AACAAAGAAA CAGCTGAATA
     CTCTTATCTT TTCAAGTCTA GTTCCAGTCC TTGTTTCTTT GTCGACTTAT

 301 CCAAACAGGA TATCTGTGGT AAGCGGTTCC TGCCCCGGCT CAGGGCCAAG
     GGTTTGTCCT ATAGACACCA TTCGCCAAGG ACGGGGCCGA GTCCCGGTTC

 351 AACAGATGAG ACAGCTGAGT GATGGGCCAA ACAGGATATC TGTGGTAAGC
     TTGTCTACTC TGTCGACTCA CTACCCGGTT TGTCCTATAG ACACCATTCG

                    AvaI
                    ~~~~~~
 401 AGTTCCTGCC CCGGCTCGGG GCCAAGAACA GATGGTCCCC AGATGCGGTC
     TCAAGGACGG GGCCGAGCCC CGGTTCTTGT CTACCAGGGG TCTACGCCAG
```

Fig. 14-1

```
451  CAGCCCTCAG CAGTTTCTAG TGAATCATCA GATGTTTCCA GGGTGCCCCA
     GTCGGGAGTC GTCAAAGATC ACTTAGTAGT CTACAAAGGT CCCACGGGGT

     ----------|----------|----------|----------|----------|----------|

501  AGGACCTGAA AATGACCCTG TACCTTATTT GAACTAACCA ATCAGTTCGC
     TCCTGGACTT TTACTGGGAC ATGGAATAAA CTTGATTGGT TAGTCAAGCG

     ----------|----------|----------|----------|----------|----------|

551  TTCTCGCTTC TGTTCGCGCG CTTCCGCTCT CCGAGCTCAA TAAAAGAGCC
     AAGAGCGAAG ACAAGCGCGC GAAGGCGAGA GGCTCGAGTT ATTTTCTCGG

     ----------|----------|----------|----------|----------|----------|
                                                  XmaI
                                                  ~~~~~
                                                  SmaI
                                                  ~~~~~
                                                  AvaI
                                                  ~~~~~

601  CACAACCCCT CACTCGGCGC GCCAGTCTTC CGATAGACTG CGTCGCCCGG
     GTGTTGGGGA GTGAGCCGCG CGGTCAGAAG GCTATCTGAC GCAGCGGGCC

     ----------|----------|----------|----------|----------|----------|
     XmaI
     ~
     SmaI
     ~
     AvaI
     ~

651  GTACCCGTAT TCCCAATAAA GCCTCTTGCT GTTTGCATCC GAATCGTGGT
     CATGGGCATA AGGGTTATTT CGGAGAACGA CAAACGTAGG CTTAGCACCA

     ----------|----------|----------|----------|----------|----------|

701  CTCGCTGTTC CTTGGGAGGG TCTCCTCTGA GTGATTGACT ACCCACGACG
     GAGCGACAAG GAACCCTCCC AGAGGAGACT CACTAACTGA TGGGTGCTGC

     ----------|----------|----------|----------|----------|----------|
```

Fig. 14-2

```
751  GGGGTCTTTC ATTTGGGGGC TCGTCCGGGA TTTGGAGACC CCTGCCCAGG
     CCCCAGAAAG TAAACCCCCG AGCAGGCCCT AAACCTCTGG GGACGGGTCC

801  GACCACCGAC CCACCACCGG GAGGTAAGCT GGCCAGCAAC TTATCTGTGT
     CTGGTGGCTG GGTGGTGGCC CTCCATTCGA CCGGTCGTTG AATAGACACA

851  CTGTCCGATT GTCTAGTGTC TATGTTTGAT GTTATGCGCC TGCGTCTGTA
     GACAGGCTAA CAGATCACAG ATACAAACTA CAATACGCGG ACGCAGACAT

901  CTAGTTAGCT AACTAGCTCT GTATCTGGCG GACCCGTGGT GGAACTGACG
     GATCAATCGA TTGATCGAGA CATAGACCGC CTGGGCACCA CCTTGACTGC

951  AGTTCTGAAC ACCCGGCCGC AACCCTGGGA GACGTCCCAG GGACTTTGGG
     TCAAGACTTG TGGGCCGGCG TTGGGACCCT CTGCAGGGTC CCTGAAACCC

1001 GGCCGTTTTT GTGGCCCGAC CTGAGGAAGG GAGTCGATGT GGAATCCGAC
     CCGGCAAAAA CACCGGGCTG GACTCCTTCC CTCAGCTACA CCTTAGGCTG

1051 CCCGTCAGGA TATGTGGTTC TGGTAGGAGA CGAGAACCTA AAACAGTTCC
     GGGCAGTCCT ATACACCAAG ACCATCCTCT GCTCTTGGAT TTTGTCAAGG

1101 CGCCTCCGTC TGAATTTTTG CTTTCGGTTT GGAACCGAAG CCGCGCGTCT
     GCGGAGGCAG ACTTAAAAAC GAAAGCCAAA CCTTGGCTTC GGCGCGCAGA

          PstI     PstI
          ~~~~~~   ~~~~~~
1151 TGTCTGCTGC AGCGCTGCAG CATCGTTCTG TGTTGTCTCT GTCTGACTGT
     ACAGACGACG TCGCGACGTC GTAGCAAGAC ACAACAGAGA CAGACTGACA
```

Fig. 14-3

```
1201  GTTTCTGTAT TTGTCTGAAA ATTAGGGCCA GACTGTTACC ACTCCCTTAA
      CAAAGACATA AACAGACTTT TAATCCCGGT CTGACAATGG TGAGGGAATT

      ----------|----------|----------|----------|----------|----------

1251  GTTTGACCTT AGGTCACTGG AAAGATGTCG AGCGGATCGC TCACAACCAG
      CAAACTGGAA TCCAGTGACC TTTCTACAGC TCGCCTAGCG AGTGTTGGTC

      ----------|----------|----------|----------|----------|----------
                                     PstI
                                     ~~~~~~

1301  TCGGTAGATG TCAAGAAGAG ACGTTGGGTT ACCTTCTGCT CTGCAGAATG
      AGCCATCTAC AGTTCTTCTC TGCAACCCAA TGGAAGACGA GACGTCTTAC

      ----------|----------|----------|----------|----------|----------

1351  GCCAACCTTT AACGTCGGAT GGCCGCGAGA CGGCACCTTT AACCGAGACC
      CGGTTGGAAA TTGCAGCCTA CCGGCGCTCT GCCGTGGAAA TTGGCTCTGG

      ----------|----------|----------|----------|----------|----------

1401  TCATCACCCA GGTTAAGATC AAGGTCTTTT CACCTGGCCC GCATGGACAC
      AGTAGTGGGT CCAATTCTAG TTCCAGAAAA GTGGACCGGG CGTACCTGTG

      ----------|----------|----------|----------|----------|----------

1451  CCAGACCAGG TCCCCTACAT CGTGACCTGG GAAGCCTTGG CTTTTGACCC
      GGTCTGGTCC AGGGGATGTA GCACTGGACC CTTCGGAACC GAAAACTGGG

      ----------|----------|----------|----------|----------|----------

1501  CCCTCCCCTGG GTCAAGCCCT TTGTACACCC TAAGCCTCCG CCTCCTCTTC
      GGGAGGGACC CAGTTCGGGA AACATGTGGG ATTCGGAGGC GGAGGAGAAG

      ----------|----------|----------|----------|----------|----------

1551  CTCCATCCGC CCCGTCTCTC CCCCTTGAAC CTCCTCGTTC GACCCCGCCT
      GAGGTAGGCG GGGCAGAGAG GGGGAACTTG GAGGAGCAAG CTGGGGCGGA

      ----------|----------|----------|----------|----------|----------

1601  CGATCCTCCC TTTATCCAGC CCTCACTCCT TCTCTAGGCG CCGGATGAAC
      GCTAGGAGGG AAATAGGTCG GGAGTGAGGA AGAGATCCGC GGCCTACTTG

      ----------|----------|----------|----------|----------|----------
```

Fig. 14-4

```
1651  CTTGTAATGC TTATTCTAGC CCTCTGGGCC CCGGTCGCGG GTAGTATGCC
      GAACATTACG AATAAGATCG GGAGACCCGG GGCCAGCGCC CATCATACGG

      ----------|----------|----------|----------|----------|----------

1701  TGAATTATCC TTGACTCTTT TCGATGAACC TCCGCCCTTG GTGGAGACGG
        ACTTAATAGG AACTGAGAAA AGCTACTTGG AGGCGGGAAC CACCTCTGCC

      ----------|----------|----------|----------|----------|----------

1751  AGCCGTTACC GCCTCTGTCC GATGTTTCGG AGTACCGAGT AGAGTATTCC
        TCGGCAATGG CGGAGACAGG CTACAAAGCC TCATGGCTCA TCTCATAAGG

      ----------|----------|----------|----------|----------|----------

1801  GAGGCGCGCT GCGTGCTCCG ATCGGGCGGT CGACTGGAGG CTCTGTGGAC
        CTCCGCGCGA CGCACGAGGC TAGCCCGCCA GCTGACCTCC GAGACACCTG

      ----------|----------|----------|----------|----------|----------
                                    XmaI
                                    ~~~~~~~
                                     SmaI
                                     ~~~~~~~
                                     AvaI
                                     ~~~~~~~
1851  CCTGCGCGGG AACCTGTCCG TGCCCACGCC GACACCCCGG GTGTACTACC
      GGACGCGCCC TTGGACAGGC ACGGGTGCGG CTGTGGGGCC CACATGATGG

      ----------|----------|----------|----------|----------|----------

1901  AGACGCTGGA GGGCTACGCG GATCGAGTGC CGACGCCGGT GGAGGACGTC
      TCTGCGACCT CCCGATGCGC CTAGCTCACG GCTGCGGCCA CCTCCTGCAG

      ----------|----------|----------|----------|----------|----------

1951  TCCGAAAGCC TCGTCGCAAA ACGCTACTGG CTCCGGGACT ATCGTGTTCC
      AGGCTTTCGG AGCAGCGTTT TGCGATGACC GAGGCCCTGA TAGCACAAGG

      ----------|----------|----------|----------|----------|----------

2001  CCAACGCACA AAACTCGTGT TGTTCTACTT TTCCCCCTGC CACCAATGCC
      GGTTGCGTGT TTTGAGCACA ACAAGATGAA AAGGGGGACG GTGGTTACGG

      ----------|----------|----------|----------|----------|----------
```

Fig. 14-5

```
2051  AAACTTATTA TGTAGAGTGC GAACCCCGGT GCCTCGTGCC TTGGGTTCCC
      TTTGAATAAT ACATCTCACG CTTGGGGCCA CGGAGCACGG AACCCAAGGG

      ----------|----------|----------|----------|----------|----------

2101  CTGTGGAGCT CGTTAGAGGA CATCGAACGA CTATTGTTCG AAGATCGCCG
      GACACCTCGA GCAATCTCCT GTAGCTTGCT GATAACAAGC TTCTAGCGGC

      ----------|----------|----------|----------|----------|----------

2151  TCTAATGGCG TACTACGCGC TCACGATTAA GTCGGCGCAG TATACGCTGA
      AGATTACCGC ATGATGCGCG AGTGCTAATT CAGCCGCGTC ATATGCGACT

      ----------|----------|----------|----------|----------|----------

2201  TGATGGTGGC AGTGATTCAA GTGTTTTGGG GGCTGTATGT GAAAGGTTGG
      ACTACCACCG TCACTAAGTT CACAAAACCC CCGACATACA CTTTCCAACC

      ----------|----------|----------|----------|----------|----------

2251  CTGCACCGAC ATTTTCCCTG GATGTTTTCG GACCAGTGGT GAAATTCGTT
      GACGTGGCTG TAAAAGGGAC CTACAAAAGC CTGGTCACCA CTTTAAGCAA

      ----------|----------|----------|----------|----------|----------
                BamHI
                ~~~~~~
          AvaI
          ~~~~~
2301  AACTCGAGGA TCCGGCTGTG GAATGTGTGT CAGTTAGGGT GTGGAAAGTC
      TTGAGCTCCT AGGCCGACAC CTTACACACA GTCAATCCCA CACCTTTCAG

      ----------|----------|----------|----------|----------|----------

2351  CCCAGGCTCC CCAGCAGGCA GAAGTATGCA AAGCATGCAT CTCAATTAGT
      GGGTCCGAGG GGTCGTCCGT CTTCATACGT TTCGTACGTA GAGTTAATCA

      ----------|----------|----------|----------|----------|----------

2401  CAGCAACCAG GTGTGGAAAG TCCCCAGGCT CCCCAGCAGG CAGAAGTATG
      GTCGTTGGTC CACACCTTTC AGGGGTCCGA GGGGTCGTCC GTCTTCATAC

      ----------|----------|----------|----------|----------|----------
```

Fig. 14-6

```
2451  CAAAGCATGC ATCTCAATTA GTCAGCAACC ATAGTCCCGC CCCTAACTCC
      GTTTCGTACG TAGAGTTAAT CAGTCGTTGG TATCAGGGCG GGGATTGAGG

      ----------------------------------------------------------

                                                      NcoI
                                                      ~~~~~
2501  GCCCATCCCG CCCCTAACTC CGCCCAGTTC CGCCCATTCT CCGCCCCATG
      CGGGTAGGGC GGGGATTGAG GCGGGTCAAG GCGGGTAAGA GGCGGGGTAC

      ----------------------------------------------------------

      NcoI
      ~
2551  GCTGACTAAT TTTTTTTATT TATGCAGAGG CCGAGGCCGC CTCGGCCTCT
      CGACTGATTA AAAAAAATAA ATACGTCTCC GGCTCCGGCG GAGCCGGAGA

      ----------------------------------------------------------

2601  GAGCTATTCC AGAAGTAGTG AGGAGGCTTT TTTGGAGGCC TAGGCTTTTG
      CTCGATAAGG TCTTCATCAC TCCTCCGAAA AAACCTCCGG ATCCGAAAAC

      ----------------------------------------------------------

            HindIII    PstI
            ~~~~~~     ~~~~~~
2651  CAAAAAGCTT GGGCTGCAGG TCGAGGCGGA TCTGATCAAG AGACAGGATG
      GTTTTTCGAA CCCGACGTCC AGCTCCGCCT AGACTAGTTC TCTGTCCTAC

      ----------------------------------------------------------

2701  AGGATCGTTT CGCATGATTG AACAAGATGG ATTGCACGCA GGTTCTCCGG
      TCCTAGCAAA GCGTACTAAC TTGTTCTACC TAACGTGCGT CCAAGAGGCC

      ----------------------------------------------------------

2751  CCGCTTGGGT GGAGAGGCTA TTCGGCTATG ACTGGGCACA ACAGACAATC
      GGCGAACCCA CCTCTCCGAT AAGCCGATAC TGACCCGTGT TGTCTGTTAG

      ----------------------------------------------------------

2801  GGCTGCTCTG ATGCCGCCGT GTTCCGGCTG TCAGCGCAGG GGCGCCCGGT
      CCGACGAGAC TACGGCGGCA CAAGGCCGAC AGTCGCGTCC CCGCGGGCCA

      ----------------------------------------------------------
```

Fig. 14-7

```
                                PstI
                                ~~~~~~
2851  TCTTTTTTGTC AAGACCGACC TGTCCGGTGC CCTGAATGAA CTGCAGGACG
      AGAAAAACAG TTCTGGCTGG ACAGGCCACG GGACTTACTT GACGTCCTGC

      ----------|----------|----------|----------|----------|----------|
2901  AGGCAGCGCG GCTATCGTGG CTGGCCACGA CGGGCGTTCC TTGCGCAGCT
      TCCGTCGCGC CGATAGCACC GACCGGTGCT GCCCGCAAGG AACGCGTCGA

      ----------|----------|----------|----------|----------|----------|
2951  GTGCTCGACG TTGTCACTGA AGCGGGAAGG GACTGGCTGC TATTGGGCGA
      CACGAGCTGC AACAGTGACT TCGCCCTTCC CTGACCGACG ATAACCCGCT

      ----------|----------|----------|----------|----------|----------|
3001  AGTGCCGGGG CAGGATCTCC TGTCATCTCA CCTTGCTCCT GCCGAGAAAG
      TCACGGCCCC GTCCTAGAGG ACAGTAGAGT GGAACGAGGA CGGCTCTTTC

      ----------|----------|----------|----------|----------|----------|
3051  TATCCATCAT GGCTGATGCA ATGCGGCGGC TGCATACGCT TGATCCGGCT
      ATAGGTAGTA CCGACTACGT TACGCCGCCG ACGTATGCGA ACTAGGCCGA

      ----------|----------|----------|----------|----------|----------|
3101  ACCTGCCCAT TCGACCACCA AGCGAAACAT CGCATCGAGC GAGCACGTAC
      TGGACGGGTA AGCTGGTGGT TCGCTTTGTA GCGTAGCTCG CTCGTGCATG

      ----------|----------|----------|----------|----------|----------|
3151  TCGGATGGAA GCCGGTCTTG TCGATCAGGA TGATCTGGAC GAAGAGCATC
      AGCCTACCTT CGGCCAGAAC AGCTAGTCCT ACTAGACCTG CTTCTCGTAG

      ----------|----------|----------|----------|----------|----------|
3201  AGGGGCTCGC GCCAGCCGAA CTGTTCGCCA GGCTCAAGGC GCGCATGCCC
      TCCCCGAGCG CGGTCGGCTT GACAAGCGGT CCGAGTTCCG CGCGTACGGG

      ----------|----------|----------|----------|----------|----------|
```

Fig. 14-8

NcoI
~~~~~~

```
3251  GACGGCGAGG ATCTCGTCGT GACCCATGGC GATGCCTGCT TGCCGAATAT
      CTGCCGCTCC TAGAGCAGCA CTGGGTACCG CTACGGACGA ACGGCTTATA
-------------------------------------------------------------

3301  CATGGTGGAA AATGGCCGCT TTTCTGGATT CATCGACTGT GGCCGGCTGG
      GTACCACCTT TTACCGGCGA AAAGACCTAA GTAGCTGACA CCGGCCGACC
-------------------------------------------------------------

3351  GTGTGGCGGA CCGCTATCAG GACATAGCGT TGGCTACCCG TGATATTGCT
      CACACCGCCT GGCGATAGTC CTGTATCGCA ACCGATGGGC ACTATAACGA
-------------------------------------------------------------

3401  GAAGAGCTTG GCGGCGAATG GGCTGACCGC TTCCTCGTGC TTTACGGTAT
      CTTCTCGAAC CGCCGCTTAC CCGACTGGCG AAGGAGCACG AAATGCCATA
-------------------------------------------------------------

3451  CGCCGCTCCC GATTCGCAGC GCATCGCCTT CTATCGCCTT CTTGACGAGT
      GCGGCGAGGG CTAAGCGTCG CGTAGCGGAA GATAGCGGAA GAACTGCTCA
-------------------------------------------------------------

3501  TCTTCTGAGC GGGACTCTGG GGTTCGATAA AATAAAAGAT TTTATTTAGT
      AGAAGACTCG CCCTGAGACC CCAAGCTATT TTATTTTCTA AAATAAATCA
-------------------------------------------------------------

3551  CTCCAGAAAA AGGGGGGAAT GAAAGACCCC ACCTGTAGGT TTGGCAAGCT
      GAGGTCTTTT TCCCCCCTTA CTTTCTGGGG TGGACATCCA AACCGTTCGA
-------------------------------------------------------------

3601  AGCTTAAGTA ACGCCATTTT GCAAGGCATG GAAAAATACA TAACTGAGAA
      TCGAATTCAT TGCGGTAAAA CGTTCCGTAC CTTTTTATGT ATTGACTCTT
-------------------------------------------------------------

3651  TAGAGAAGTT CAGATCAAGG TCAGGAACAG ATGGAACAGC TGAATATGGG
      ATCTCTTCAA GTCTAGTTCC AGTCCTTGTC TACCTTGTCG ACTTATACCC
-------------------------------------------------------------
```

Fig. 14-9
~~~~~~

```
3701  CCAAACAGGA TATCTGTGGT AAGCAGTTCC TGCCCCGGCT CAGGGCCAAG
      GGTTTGTCCT ATAGACACCA TTCGTCAAGG ACGGGGCCGA GTCCCGGTTC

3751  AACAGATGGA ACAGCTGAAT ATGGGCCAAA CAGGATATCT GTGGTAAGCA
      TTGTCTACCT TGTCGACTTA TACCCGGTTT GTCCTATAGA CACCATTCGT

3801  GTTCCTGCCC CGGCTCAGGG CCAAGAACAG ATGGTCCCCA GATGCGGTCC
      CAAGGACGGG GCCGAGTCCC GGTTCTTGTC TACCAGGGGT CTACGCCAGG

3851  AGCCCTCAGC AGTTTCTAGA GAACCATCAG ATGTTTCCAG GGTGCCCCAA
      TCGGGAGTCG TCAAAGATCT CTTGGTAGTC TACAAAGGTC CCACGGGGTT

3901  GGACCTGAAA TGACCCTGTG CCTTATTTGA ACTAACCAAT CAGTTCGCTT
      CCTGGACTTT ACTGGGACAC GGAATAAACT TGATTGGTTA GTCAAGCGAA

                                   AvaI
                                   ~~~~~~~
3951  CTCGCTTCTG TTCGCGCGCT TCTGCTCCCC GAGCTCAATA AAAGAGCCCA
      GAGCGAAGAC AAGCGCGCGA AGACGAGGGG CTCGAGTTAT TTTCTCGGGT

                                                    XmaI
                                                    ~~~~~~
                                                    SmaI
                                                    ~~~~~~
                                                    AvaI
                                                    ~~~~~~
                    AvaI
                    ~~~~~~
4001  CAACCCCTCA CTCGGGGCGC CAGTCCTCCG ATTGACTGAG TCGCCCGGGT
      GTTGGGGAGT GAGCCCCGCG GTCAGGAGGC TAACTGACTC AGCGGGCCCA
```

Fig. 14-10

```
4051  ACCCGTGTAT CCAATAAACC CTCTTGCAGT TGCATCCGAC TTGTGGTCTC
      TGGGCACATA GGTTATTTGG GAGAACGTCA ACGTAGGCTG AACACCAGAG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4101  GCTGTTCCTT GGGAGGGTCT CCTCTGAGTG ATTGACTACC CGTCAGCGGG
      CGACAAGGAA CCCTCCCAGA GGAGACTCAC TAACTGATGG GCAGTCGCCC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4151  GGTCTTTCAT TTGGGGGCTC GTCCGGGATC GGGAGACCCC TGCCCAGGGA
      CCAGAAAGTA AACCCCCGAG CAGGCCCTAG CCCTCTGGGG ACGGGTCCCT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4201  CCACCGACCC ACCACCGGGA GGTAAGCTGG CTGCCTCGCG CGTTTCGGTG
      GGTGGCTGGG TGGTGGCCCT CCATTCGACC GACGGAGCGC GCAAAGCCAC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4251  ATGACGGTGA AAACCTCTGA CACATGCAGC TCCCGGAGAC GGTCACAGCT
      TACTGCCACT TTTGGAGACT GTGTACGTCG AGGGCCTCTG CCAGTGTCGA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4301  TGTCTGTAAG CGGATGCCGG GAGCAGACAA GCCCGTCAGG GCGCGTCAGC
      ACAGACATTC GCCTACGGCC CTCGTCTGTT CGGGCAGTCC CGCGCAGTCG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4351  GGGTGTTGGC GGGTGTCGGG GCGCAGCCAT GACCCAGTCA CGTAGCGATA
      CCCACAACCG CCCACAGCCC CGCGTCGGTA CTGGGTCAGT GCATCGCTAT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4401  GCGGAGTGTA TACTGGCTTA ACTATGCGGC ATCAGAGCAG ATTGTACTGA
      CGCCTCACAT ATGACCGAAT TGATACGCCG TAGTCTCGTC TAACATGACT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

            ApaLI
            ~~~~~~
4451  GAGTGCACCA TATGCGGTGT GAAATACCGC ACAGATGCGT AAGGAGAAAA
      CTCACGTGGT ATACGCCACA CTTTATGGCG TGTCTACGCA TTCCTCTTTT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------
```

Fig. 14-11

```
4501  TACCGCATCA GGCGCTCTTC CGCTTCCTCG CTCACTGACT CGCTGCGCTC
      ATGGCGTAGT CCGCGAGAAG GCGAAGGAGC GAGTGACTGA GCGACGCGAG

      ----------|----------|----------|----------|----------|----------

4551  GGTCGTTCGG CTGCGGCGAG CGGTATCAGC TCACTCAAAG GCGGTAATAC
      CCAGCAAGCC GACGCCGCTC GCCATAGTCG AGTGAGTTTC CGCCATTATG

      ----------|----------|----------|----------|----------|----------

4601  GGTTATCCAC AGAATCAGGG GATAACGCAG GAAAGAACAT GTGAGCAAAA
      CCAATAGGTG TCTTAGTCCC CTATTGCGTC CTTTCTTGTA CACTCGTTTT

      ----------|----------|----------|----------|----------|----------

4651  GGCCAGCAAA AGGCCAGGAA CCGTAAAAAG GCCGCGTTGC TGGCGTTTTT
      CCGGTCGTTT TCCGGTCCTT GGCATTTTTC CGGCGCAACG ACCGCAAAAA

      ----------|----------|----------|----------|----------|----------

4701  CCATAGGCTC CGCCCCCCTG ACGAGCATCA CAAAATCGA CGCTCAAGTC
      GGTATCCGAG GCGGGGGGAC TGCTCGTAGT GTTTTTAGCT GCGAGTTCAG

      ----------|----------|----------|----------|----------|----------

4751  AGAGGTGGCG AAACCCGACA GGACTATAAA GATACCAGGC GTTTCCCCCT
      TCTCCACCGC TTTGGGCTGT CCTGATATTT CTATGGTCCG CAAAGGGGGA

      ----------|----------|----------|----------|----------|----------

4801  GGAAGCTCCC TCGTGCGCTC TCCTGTTCCG ACCCTGCCGC TTACCGGATA
      CCTTCGAGGG AGCACGCGAG AGGACAAGGC TGGGACGGCG AATGGCCTAT

      ----------|----------|----------|----------|----------|----------

4851  CCTGTCCGCC TTTCTCCCTT CGGGAAGCGT GGCGCTTTCT CATAGCTCAC
      GGACAGGCGG AAAGAGGGAA GCCCTTCGCA CCGCGAAAGA GTATCGAGTG

      ----------|----------|----------|----------|----------|----------

4901  GCTGTAGGTA TCTCAGTTCG GTGTAGGTCG TTCGCTCCAA GCTGGGCTGT
      CGACATCCAT AGAGTCAAGC CACATCCAGC AAGCGAGGTT CGACCCGACA

      ----------|----------|----------|----------|----------|----------
```

Fig. 14-12

```
      ApaLI
      ~~~~~~
4951  GTGCACGAAC CCCCCGTTCA GCCCGACCGC TGCGCCTTAT CCGGTAACTA
      CACGTGCTTG GGGGGCAAGT CGGGCTGGCG ACGCGGAATA GGCCATTGAT

      ----------|----------|----------|----------|----------|----------
5001  TCGTCTTGAG TCCAACCCGG TAAGACACGA CTTATCGCCA CTGGCAGCAG
      AGCAGAACTC AGGTTGGGCC ATTCTGTGCT GAATAGCGGT GACCGTCGTC

      ----------|----------|----------|----------|----------|----------
5051  CCACTGGTAA CAGGATTAGC AGAGCGAGGT ATGTAGGCGG TGCTACAGAG
      GGTGACCATT GTCCTAATCG TCTCGCTCCA TACATCCGCC ACGATGTCTC

      ----------|----------|----------|----------|----------|----------
5101  TTCTTGAAGT GGTGGCCTAA CTACGGCTAC ACTAGAAGGA CAGTATTTGG
      AAGAACTTCA CCACCGGATT GATGCCGATG TGATCTTCCT GTCATAAACC

      ----------|----------|----------|----------|----------|----------
5151  TATCTGCGCT CTGCTGAAGC CAGTTACCTT CGGAAAAAGA GTTGGTAGCT
      ATAGACGCGA GACGACTTCG GTCAATGGAA GCCTTTTTCT CAACCATCGA

      ----------|----------|----------|----------|----------|----------
5201  CTTGATCCGG CAAACAAACC ACCGCTGGTA GCGGTGGTTT TTTTGTTTGC
      GAACTAGGCC GTTTGTTTGG TGGCGACCAT CGCCACCAAA AAAACAAACG

      ----------|----------|----------|----------|----------|----------
5251  AAGCAGCAGA TTACGCGCAG AAAAAAAGGA TCTCAAGAAG ATCCTTTGAT
      TTCGTCGTCT AATGCGCGTC TTTTTTTCCT AGAGTTCTTC TAGGAAACTA

      ----------|----------|----------|----------|----------|----------
5301  CTTTTCTACG GGGTCTGACG CTCAGTGGAA CGAAAACTCA CGTTAAGGGA
      GAAAAGATGC CCCAGACTGC GAGTCACCTT GCTTTTGAGT GCAATTCCCT

      ----------|----------|----------|----------|----------|----------
5351  TTTTGGTCAT GAGATTATCA AAAAGGATCT TCACCTAGAT CCTTTTAAAT
      AAAACCAGTA CTCTAATAGT TTTTCCTAGA AGTGGATCTA GGAAAATTTA

      ----------|----------|----------|----------|----------|----------
```

Fig. 14-13

```
5401  TAAAAATGAA GTTTTAAATC AATCTAAAGT ATATATGAGT AAACTTGGTC
      ATTTTTACTT CAAAATTTAG TTAGATTTCA TATATACTCA TTTGAACCAG

5451  TGACAGTTAC CAATGCTTAA TCAGTGAGGC ACCTATCTCA GCGATCTGTC
      ACTGTCAATG GTTACGAATT AGTCACTCCG TGGATAGAGT CGCTAGACAG

5501  TATTTCGTTC ATCCATAGTT GCCTGACTCC CCGTCGTGTA GATAACTACG
      ATAAAGCAAG TAGGTATCAA CGGACTGAGG GGCAGCACAT CTATTGATGC

5551  ATACGGGAGG GCTTACCATC TGGCCCCAGT GCTGCAATGA TACCGCGAGA
      TATGCCCTCC CGAATGGTAG ACCGGGGTCA CGACGTTACT ATGGCGCTCT

5601  CCCACGCTCA CCGGCTCCAG ATTTATCAGC AATAAACCAG CCAGCCGGAA
      GGGTGCGAGT GGCCGAGGTC TAAATAGTCG TTATTTGGTC GGTCGGCCTT

5651  GGGCCGAGCG CAGAAGTGGT CCTGCAACTT TATCCGCCTC CATCCAGTCT
      CCCGGCTCGC GTCTTCACCA GGACGTTGAA ATAGGCGGAG GTAGGTCAGA

5701  ATTAATTGTT GCCGGGAAGC TAGAGTAAGT AGTTCGCCAG TTAATAGTTT
      TAATTAACAA CGGCCCTTCG ATCTCATTCA TCAAGCGGTC AATTATCAAA

                              PstI
                              ~~~~~~
5751  GCGCAACGTT GTTGCCATTG CTGCAGGCAT CGTGGTGTCA CGCTCGTCGT
      CGCGTTGCAA CAACGGTAAC GACGTCCGTA GCACCACAGT GCGAGCAGCA

5801  TTGGTATGGC TTCATTCAGC TCCGGTTCCC AACGATCAAG GCGAGTTACA
      AACCATACCG AAGTAAGTCG AGGCCAAGGG TTGCTAGTTC CGCTCAATGT
```

Fig. 14-14

```
5851  TGATCCCCCA TGTTGTGCAA AAAAGCGGTT AGCTCCTTCG GTCCTCCGAT
      ACTAGGGGGT ACAACACGTT TTTTCGCCAA TCGAGGAAGC CAGGAGGCTA
-------------------------------------------------------------
5901  CGTTGTCAGA AGTAAGTTGG CCGCAGTGTT ATCACTCATG GTTATGGCAG
      GCAACAGTCT TCATTCAACC GGCGTCACAA TAGTGAGTAC CAATACCGTC
-------------------------------------------------------------
5951  CACTGCATAA TTCTCTTACT GTCATGCCAT CCGTAAGATG CTTTTCTGTG
      GTGACGTATT AAGAGAATGA CAGTACGGTA GGCATTCTAC GAAAAGACAC
-------------------------------------------------------------
6001  ACTGGTGAGT ACTCAACCAA GTCATTCTGA GAATAGTGTA TGCGGCGACC
      TGACCACTCA TGAGTTGGTT CAGTAAGACT CTTATCACAT ACGCCGCTGG
-------------------------------------------------------------
6051  GAGTTGCTCT TGCCCGGCGT CAACACGGGA TAATACCGCG CCACATAGCA
      CTCAACGAGA ACGGGCCGCA GTTGTGCCCT ATTATGGCGC GGTGTATCGT
-------------------------------------------------------------
6101  GAACTTTAAA AGTGCTCATC ATTGGAAAAC GTTCTTCGGG GCGAAAACTC
      CTTGAAATTT TCACGAGTAG TAACCTTTTG CAAGAAGCCC CGCTTTTGAG
-------------------------------------------------------------
                                                      ApaLI
                                                      ~~~~
6151  TCAAGGATCT TACCGCTGTT GAGATCCAGT TCGATGTAAC CCACTCGTGC
      AGTTCCTAGA ATGGCGACAA CTCTAGGTCA AGCTACATTG GGTGAGCACG
-------------------------------------------------------------
      ApaLI
      ~~
6201  ACCCAACTGA TCTTCAGCAT CTTTTACTTT CACCAGCGTT TCTGGGTGAG
      TGGGTTGACT AGAAGTCGTA GAAAATGAAA GTGGTCGCAA AGACCCACTC
-------------------------------------------------------------
```

Fig. 14-15

```
6251  CAAAAACAGG AAGGCAAAAT GCCGCAAAAA AGGGAATAAG GGCGACACGG
      GTTTTTGTCC TTCCGTTTTA CGGCGTTTTT TCCCTTATTC CCGCTGTGCC

6301  AAATGTTGAA TACTCATACT CTTCCTTTTT CAATATTATT GAAGCATTTA
      TTTACAACTT ATGAGTATGA GAAGGAAAAA GTTATAATAA CTTCGTAAAT

6351  TCAGGGTTAT TGTCTCATGA GCGGATACAT ATTTGAATGT ATTTAGAAAA
      AGTCCCAATA ACAGAGTACT CGCCTATGTA TAAACTTACA TAAATCTTTT

6401  ATAAACAAAT AGGGGTTCCG CGCACATTTC CCCGAAAAGT GCCACCTGAC
      TATTTGTTTA TCCCCAAGGC GCGTGTAAAG GGGCTTTTCA CGGTGGACTG

6451  GTCTAAGAAA CCATTATTAT CATGACATTA ACCTATAAAA ATAGGCGTAT
      CAGATTCTTT GGTAATAATA GTACTGTAAT TGGATATTTT TATCCGCATA

6501  CACGAGGCCC TTTCGTCTTC AA
      GTGCTCCGGG AAAGCAGAAG TT
```

Fig. 14-16

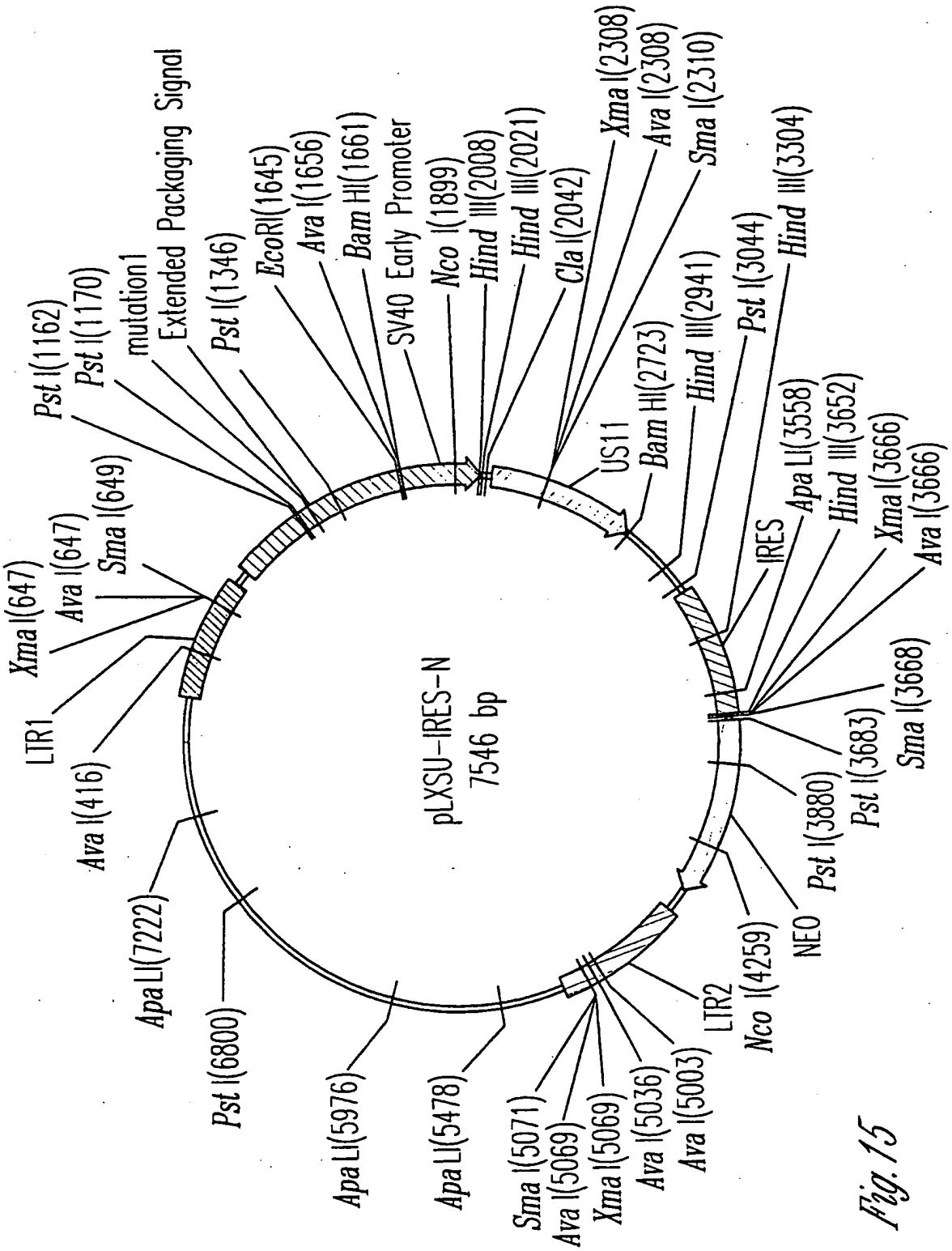
pLXSU-IRES-N
7546 bp
LTR1
Ava I(416)
Apa LI(7222)
Pst I(6800)
Apa LI(5976)
Apa LI(5478)
Sma I(5071)
Ava I(5069)
Xma I(5069)
Ava I(5036)
Ava I(5003)
LTR2
Nco I(4259)
NEO
Pst I(3880)
Pst I(3683)
Sma I(3668)
Xma I(3666)
Ava I(3666)
IRES
Apa LI(3558)
Hind III(3652)
Hind III(3304)
Pst I(3044)
Hind III(2941)
Sma I(2310)
Ava I(2308)
Xma I(2308)
US11
Bam HI(2723)
Cla I(2042)
Hind III(2021)
Hind III(2008)
Nco I(1899)
SV40 Early Promoter
Bam HI(1661)
Ava I(1656)
EcoRI(1645)
Pst I(1346)
Extended Packaging Signal
mutation1
Pst I(1170)
Pst I(1162)
Sma I(649)
Ava I(647)
Xma I(647)

Fig. 15

```
   1  GAATTGCTAG CAATTGCTAG CAATTGCTAG CAATTCATAC CAGATCACCG
      CTTAACGATC GTTAACGATC GTTAACGATC GTTAAGTATG GTCTAGTGGC

  51  AAAACTGTCC TCCAAATGTG TCCCCCTCAC ACTCCCAAAT TCGCGGGCTT
      TTTTGACAGG AGGTTTACAC AGGGGGAGTG TGAGGGTTTA AGCGCCCGAA

 101  CTGCCTCTTA GACCACTCTA CCCTATTCCC CACACTCACC GGAGCCAAAG
      GACGGAGAAT CTGGTGAGAT GGGATAAGGG GTGTGAGTGG CCTCGGTTTC

 151  CCGCGGCCCT TCCGTTTCTT TGCTTTTGAA AGACCCCACC CGTAGGTGGC
      GGCGCCGGGA AGGCAAAGAA ACGAAAACTT TCTGGGGTGG GCATCCACCG

 201  AAGCTAGCTT AAGTAACGCC ACTTTGCAAG GCATGGAAAA ATACATAACT
      TTCGATCGAA TTCATTGCGG TGAAACGTTC CGTACCTTTT TATGTATTGA

 251  GAGAATAGAA AAGTTCAGAT CAAGGTCAGG AACAAAGAAA CAGCTGAATA
      CTCTTATCTT TTCAAGTCTA GTTCCAGTCC TTGTTTCTTT GTCGACTTAT

 301  CCAAACAGGA TATCTGTGGT AAGCGGTTCC TGCCCCGGCT CAGGGCCAAG
      GGTTTGTCCT ATAGACACCA TTCGCCAAGG ACGGGGCCGA GTCCCGGTTC

 351  AACAGATGAG ACAGCTGAGT GATGGGCCAA ACAGGATATC TGTGGTAAGC
      TTGTCTACTC TGTCGACTCA CTACCCGGTT TGTCCTATAG ACACCATTCG

                       AvaI
                       ~~~~~~
 401  AGTTCCTGCC CCGGCTCGGG GCCAAGAACA GATGGTCCCC AGATGCGGTC
      TCAAGGACGG GGCCGAGCCC CGGTTCTTGT CTACCAGGGG TCTACGCCAG
```

Fig. 16-1

```
451  CAGCCCTCAG CAGTTTCTAG TGAATCATCA GATGTTTCCA GGGTGCCCCA
     GTCGGGAGTC GTCAAAGATC ACTTAGTAGT CTACAAAGGT CCCACGGGGT

     ----------|----------|----------|----------|----------|----------|

501  AGGACCTGAA AATGACCCTG TACCTTATTT GAACTAACCA ATCAGTTCGC
     TCCTGGACTT TTACTGGGAC ATGGAATAAA CTTGATTGGT TAGTCAAGCG

     ----------|----------|----------|----------|----------|----------|

551  TTCTCGCTTC TGTTCGCGCG CTTCCGCTCT CCGAGCTCAA TAAAAGAGCC
     AAGAGCGAAG ACAAGCGCGC GAAGGCGAGA GGCTCGAGTT ATTTTCTCGG

     ----------|----------|----------|----------|----------|----------|
                                                  XmaI
                                                  ~~~~~
                                                  SmaI
                                                  ~~~~~
                                                  AvaI
                                                  ~~~~~
601  CACAACCCCT CACTCGGCGC GCCAGTCTTC CGATAGACTG CGTCGCCCGG
     GTGTTGGGGA GTGAGCCGCG CGGTCAGAAG GCTATCTGAC GCAGCGGGCC

     ----------|----------|----------|----------|----------|----------|
          XmaI
          ~
          SmaI
          ~
          AvaI
          ~
651  GTACCCGTAT TCCCAATAAA GCCTCTTGCT GTTTGCATCC GAATCGTGGT
     CATGGGCATA AGGGTTATTT CGGAGAACGA CAAACGTAGG CTTAGCACCA

     ----------|----------|----------|----------|----------|----------|

701  CTCGCTGTTC CTTGGGAGGG TCTCCTCTGA GTGATTGACT ACCCACGACG
     GAGCGACAAG GAACCCTCCC AGAGGAGACT CACTAACTGA TGGGTGCTGC

     ----------|----------|----------|----------|----------|----------|
```

Fig. 16-2

```
751  GGGGTCTTTC ATTTGGGGGC TCGTCCGGGA TTTGGAGACC CCTGCCCAGG
     CCCCAGAAAG TAAACCCCCG AGCAGGCCCT AAACCTCTGG GGACGGGTCC

     ----------|----------|----------|----------|----------|----------

801  GACCACCGAC CCACCACCGG GAGGTAAGCT GGCCAGCAAC TTATCTGTGT
     CTGGTGGCTG GGTGGTGGCC CTCCATTCGA CCGGTCGTTG AATAGACACA

     ----------|----------|----------|----------|----------|----------

851  CTGTCCGATT GTCTAGTGTC TATGTTTGAT GTTATGCGCC TGCGTCTGTA
     GACAGGCTAA CAGATCACAG ATACAAACTA CAATACGCGG ACGCAGACAT

     ----------|----------|----------|----------|----------|----------

901  CTAGTTAGCT AACTAGCTCT GTATCTGGCG GACCCGTGGT GGAACTGACG
     GATCAATCGA TTGATCGAGA CATAGACCGC CTGGGCACCA CCTTGACTGC

     ----------|----------|----------|----------|----------|----------

951  AGTTCTGAAC ACCCGGCCGC AACCCTGGGA GACGTCCCAG GGACTTTGGG
     TCAAGACTTG TGGGCCGGCG TTGGGACCCT CTGCAGGGTC CCTGAAACCC

     ----------|----------|----------|----------|----------|----------

1001 GGCCGTTTTT GTGGCCCGAC CTGAGGAAGG GAGTCGATGT GGAATCCGAC
     CCGGCAAAAA CACCGGGCTG GACTCCTTCC CTCAGCTACA CCTTAGGCTG

     ----------|----------|----------|----------|----------|----------

1051 CCCGTCAGGA TATGTGGTTC TGGTAGGAGA CGAGAACCTA AAACAGTTCC
     GGGCAGTCCT ATACACCAAG ACCATCCTCT GCTCTTGGAT TTTGTCAAGG

     ----------|----------|----------|----------|----------|----------

1101 CGCCTCCGTC TGAATTTTTG CTTTCGGTTT GGAACCGAAG CCGCGCGTCT
     GCGGAGGCAG ACTTAAAAAC GAAAGCCAAA CCTTGGCTTC GGCGCGCAGA

     ----------|----------|----------|----------|----------|----------

          PstI     PstI
          ~~~~~~   ~~~~~~
1151 TGTCTGCTGC AGCGCTGCAG CATCGTTCTG TGTTGTCTCT GTCTGACTGT
     ACAGACGACG TCGCGACGTC GTAGCAAGAC ACAACAGAGA CAGACTGACA

     ----------|----------|----------|----------|----------|----------
```

Fig. 16-3

```
1201  GTTTCTGTAT TTGTCTGAAA ATTAGGGCCA GACTGTTACC ACTCCCTTAA
      CAAAGACATA AACAGACTTT TAATCCCGGT CTGACAATGG TGAGGGAATT

      ----------|----------|----------|----------|----------|----------

1251  GTTTGACCTT AGGTCACTGG AAAGATGTCG AGCGGATCGC TCACAACCAG
      CAAACTGGAA TCCAGTGACC TTTCTACAGC TCGCCTAGCG AGTGTTGGTC

      ----------|----------|----------|----------|----------|----------

                                  PstI
                                  ~~~~~~
1301  TCGGTAGATG TCAAGAAGAG ACGTTGGGTT ACCTTCTGCT CTGCAGAATG
      AGCCATCTAC AGTTCTTCTC TGCAACCCAA TGGAAGACGA GACGTCTTAC

      ----------|----------|----------|----------|----------|----------

1351  GCCAACCTTT AACGTCGGAT GGCCGCGAGA CGGCACCTTT AACCGAGACC
      CGGTTGGAAA TTGCAGCCTA CCGGCGCTCT GCCGTGGAAA TTGGCTCTGG

      ----------|----------|----------|----------|----------|----------

1401  TCATCACCCA GGTTAAGATC AAGGTCTTTT CACCTGGCCC GCATGGACAC
      AGTAGTGGGT CCAATTCTAG TTCCAGAAAA GTGGACCGGG CGTACCTGTG

      ----------|----------|----------|----------|----------|----------

1451  CCAGACCAGG TCCCCTACAT CGTGACCTGG GAAGCCTTGG CTTTTGACCC
      GGTCTGGTCC AGGGGATGTA GCACTGGACC CTTCGGAACC GAAAACTGGG

      ----------|----------|----------|----------|----------|----------

1501  CCCTCCCCTGG GTCAAGCCCT TTGTACACCC TAAGCCTCCG CCTCCTCTTC
      GGGAGGGACC CAGTTCGGGA AACATGTGGG ATTCGGAGGC GGAGGAGAAG

      ----------|----------|----------|----------|----------|----------

1551  CTCCATCCGC CCCGTCTCTC CCCCTTGAAC CTCCTCGTTC GACCCCGCCT
      GAGGTAGGCG GGGCAGAGAG GGGGAACTTG GAGGAGCAAG CTGGGGCGGA

      ----------|----------|----------|----------|----------|----------
```

Fig. 16-4

```
                                                                EcoRI
                                                                ~~~~~~
1601  CGATCCTCCC TTTATCCAGC CCTCACTCCT TCTCTAGGCG CCGGAATTCG
      GCTAGGAGGG AAATAGGTCG GGAGTGAGGA AGAGATCCGC GGCCTTAAGC
-------------------------------------------------------------------------
                  BamHI
                  ~~~~~~~
            AvaI
            ~~~~~~
1651  TTAACTCGAG GATCCGGCTG TGGAATGTGT GTCAGTTAGG GTGTGGAAAG
      AATTGAGCTC CTAGGCCGAC ACCTTACACA CAGTCAATCC CACACCTTTC
-------------------------------------------------------------------------
1701  TCCCCAGGCT CCCCAGCAGG CAGAAGTATG CAAAGCATGC ATCTCAATTA
      AGGGGTCCGA GGGGTCGTCC GTCTTCATAC GTTTCGTACG TAGAGTTAAT
-------------------------------------------------------------------------
1751  GTCAGCAACC AGGTGTGGAA AGTCCCCAGG CTCCCCAGCA GGCAGAAGTA
      CAGTCGTTGG TCCACACCTT TCAGGGGTCC GAGGGGTCGT CCGTCTTCAT
-------------------------------------------------------------------------
1801  TGCAAAGCAT GCATCTCAAT TAGTCAGCAA CCATAGTCCC GCCCCTAACT
      ACGTTTCGTA CGTAGAGTTA ATCAGTCGTT GGTATCAGGG CGGGGATTGA
-------------------------------------------------------------------------
                                                          NcoI
                                                          ~~~
1851  CCGCCCATCC CGCCCCTAAC TCCGCCCAGT TCCGCCCATT CTCCGCCCCA
      GGCGGGTAGG GCGGGGATTG AGGCGGGTCA AGGCGGGTAA GAGGCGGGGT
-------------------------------------------------------------------------
      NcoI
      ~~~
1901  TGGCTGACTA ATTTTTTTTA TTTATGCAGA GGCCGAGGCC GCCTCGGCCT
      ACCGACTGAT TAAAAAAAAT AAATACGTCT CCGGCTCCGG CGGAGCCGGA
-------------------------------------------------------------------------
```

Fig. 16-5

```
1951  CTGAGCTATT CCAGAAGTAG TGAGGAGGCT TTTTTGGAGG CCTAGGCTTT
      GACTCGATAA GGTCTTCATC ACTCCTCCGA AAAAACCTCC GGATCCGAAA

                HindIII         HindIII                  ClaI
                ~~~~~~~         ~~~~~~~                 ~~~~~~~
2001  TGCAAAAAGC TTGGGCTGCA AGCTTGGTAC CGAGCTCGGA TCGATATCTG
      ACGTTTTTCG AACCCGACGT TCGAACCATG GCTCGAGCCT AGCTATAGAC

2051  CGGCCGCGTC GACGGATGAA CCTTGTAATG CTTATTCTAG CCCTCTGGGC
      GCCGGCGCAG CTGCCTACTT GGAACATTAC GAATAAGATC GGGAGACCCG

2101  CCCGGTCGCG GGTAGTATGC CTGAATTATC CTTGACTCTT TTCGATGAAC
      GGGCCAGCGC CCATCATACG GACTTAATAG GAACTGAGAA AAGCTACTTG

2151  CTCCGCCCTT GGTGGAGACG GAGCCGTTAC CGCCTCTGTC CGATGTTTCG
      GAGGCGGGAA CCACCTCTGC CTCGGCAATG GCGGAGACAG GCTACAAAGC

2201  GAGTACCGAG TAGAGTATTC CGAGGCGCGC TGCGTGCTCC GATCGGGCGG
      CTCATGGCTC ATCTCATAAG GCTCCGCGCG ACGCACGAGG CTAGCCCGCC

2251  TCGACTGGAG GCTCTGTGGA CCCTGCGCGG GAACCTGTCC GTGCCCACGC
      AGCTGACCTC CGAGACACCT GGGACGCGCC CTTGGACAGG CACGGGTGCG
```

Fig. 16-6

```
                XmaI
                ~~~~~~~
                SmaI
                ~~~~~~~
                AvaI
                ~~~~~~~
2301  CGACACCCCG GGTGTACTAC CAGACGCTGG AGGGCTACGC GGATCGAGTG
      GCTGTGGGGC CCACATGATG GTCTGCGACC TCCCGATGCG CCTAGCTCAC
-------------------------------------------------------------
2351  CCGACGCCGG TGGAGGACGT CTCCGAAAGC CTCGTCGCAA AACGCTACTG
      GGCTGCGGCC ACCTCCTGCA GAGGCTTTCG GAGCAGCGTT TTGCGATGAC
-------------------------------------------------------------
2401  GCTCCGGGAC TATCGTGTTC CCCAACGCAC AAAACTCGTG TTGTTCTACT
      CGAGGCCCTG ATAGCACAAG GGGTTGCGTG TTTTGAGCAC AACAAGATGA
-------------------------------------------------------------
2451  TTTCCCCCTG CCACCAATGC CAAACTTATT ATGTAGAGTG CGAACCCCGG
      AAAGGGGGAC GGTGGTTACG GTTTGAATAA TACATCTCAC GCTTGGGGCC
-------------------------------------------------------------
2501  TGCCTCGTGC CTTGGGTTCC CCTGTGGAGC TCGTTAGAGG ACATCGAACG
      ACGGAGCACG GAACCCAAGG GGACACCTCG AGCAATCTCC TGTAGCTTGC
-------------------------------------------------------------
2551  ACTATTGTTC GAAGATCGCC GTCTAATGGC GTACTACGCG CTCACGATTA
      TGATAACAAG CTTCTAGCGG CAGATTACCG CATGATGCGC GAGTGCTAAT
-------------------------------------------------------------
2601  AGTCGGCGCA GTATACGCTG ATGATGGTGG CAGTGATTCA AGTGTTTTGG
      TCAGCCGCGT CATATGCGAC TACTACCACC GTCACTAAGT TCACAAAACC
-------------------------------------------------------------
2651  GGGCTGTATG TGAAAGGTTG GCTGCACCGA CATTTTCCCT GGATGTTTTC
      CCCGACATAC ACTTTCCAAC CGACGTGGCT GTAAAAGGGA CCTACAAAAG
-------------------------------------------------------------
```

Fig. 16-7

```
                                    BamHI
                                    ~~~~~~
2701  GGACCAGTGG TGAAATTCAG TGGATCCACT AGTAACGGCC GCCAGTGTGC
      CCTGGTCACC ACTTTAAGTC ACCTAGGTGA TCATTGCCGG CGGTCACACG
-------------------------------------------------------------------
2751  TGGAATTAAT TCGCTGTCTG CGAGGGCCGG CTGTTGGGGT GAGTACTCCC
      ACCTTAATTA AGCGACAGAC GCTCCCGGCC GACAACCCCA CTCATGAGGG
-------------------------------------------------------------------
2801  TCTCAAAAGC GGGCATGACT TCTGCGCTAA GATTGTCAGT TTCCAAAAAC
      AGAGTTTTCG CCCGTACTGA AGACGCGATT CTAACAGTCA AAGGTTTTTG
-------------------------------------------------------------------
2851  GAGGAGGATT TGATATTCAC CTGGCCCGCG GTGATGCCTT TGAGGGTGGC
      CTCCTCCTAA ACTATAAGTG GACCGGGCGC CACTACGGAA ACTCCCACCG
-------------------------------------------------------------------
                                              HindIII
                                              ~~~~~~~
2901  CGCGTCCATC TGGTCAGAAA AGACAATCTT TTTGTTGTCA AGCTTGAGGT
      GCGCAGGTAG ACCAGTCTTT TCTGTTAGAA AAACAACAGT TCGAACTCCA
-------------------------------------------------------------------
2951  GTGGCAGGCT TGAGATCTGG CCATACACTT GAGTGACAAT GACATCCACT
      CACCGTCCGA ACTCTAGACC GGTATGTGAA CTCACTGTTA CTGTAGGTGA
-------------------------------------------------------------------
                                              PstI
                                              ~~~~~~~
3001  TTGCCTTTCT CTCCACAGGT GTCCACTCCC AGGTCCAACT GCAGGTCGAT
      AACGGAAAGA GAGGTGTCCA CAGGTGAGGG TCCAGGTTGA CGTCCAGCTA
-------------------------------------------------------------------
```

Fig. 16-8

```
3051  CGAGCATGCA TCTAGGGCGG CCAATTCGCC CCTCTCCCTC CCCCCCCCCT
      GCTCGTACGT AGATCCCGCC GGTTAAGCGG GGAGAGGGAG GGGGGGGGGA

3101  AACGTTACTG GCCGAAGCCG CTTGGAATAA GGCCGGTGTG TGTTTGTCTA
      TTGCAATGAC CGGCTTCGGC GAACCTTATT CCGGCCACAC ACAAACAGAT

3151  TATGTGATTT TCCACCATAT TGCCGTCTTT TGGCAATGTG AGGGCCCGGA
      ATACACTAAA AGGTGGTATA ACGGCAGAAA ACCGTTACAC TCCCGGGCCT

3201  AACCTGGCCC TGTCTTCTTG ACGAGCATTC CTAGGGGTCT TTCCCCTCTC
      TTGGACCGGG ACAGAAGAAC TGCTCGTAAG GATCCCCAGA AAGGGGAGAG

3251  GCCAAAGGAA TGCAAGGTCT GTTGAATGTC GTGAAGGAAG CAGTTCCTCT
      CGGTTTCCTT ACGTTCCAGA CAACTTACAG CACTTCCTTC GTCAAGGAGA

        HindIII
        ~~~~~~
3301  GGAAGCTTCT TGAAGACAAA CAACGTCTGT AGCGACCCTT TGCAGGCAGC
      CCTTCGAAGA ACTTCTGTTT GTTGCAGACA TCGCTGGGAA ACGTCCGTCG

3351  GGAACCCCCC ACCTGGCGAC AGGTGCCTCT GCGGCCAAAA GCCACGTGTA
      CCTTGGGGGG TGGACCGCTG TCCACGGAGA CGCCGGTTTT CGGTGCACAT

3401  TAAGATACAC CTGCAAAGGC GGCACAACCC CAGTGCCACG TTGTGAGTTG
      ATTCTATGTG GACGTTTCCG CCGTGTTGGG GTCACGGTGC AACACTCAAC

3451  GATAGTTGTG GAAAGAGTCA AATGGCTCTC CTCAAGCGTA GTCAACAAGG
      CTATCAACAC CTTTCTCAGT TTACCGAGAG GAGTTCGCAT CAGTTGTTCC
```

Fig. 16-9

```
3501  GGCTGAAGGA TGCCCAGAAG GTACCCCATT GTATGGGAAT CTGATCTGGG
      CCGACTTCCT ACGGGTCTTC CATGGGGTAA CATACCCTTA GACTAGACCC
-------------------------------------------------------------------

            ApaLI
           ~~~~~~~
3551  GCCTCGGTGC ACATGCTTTA CATGTGTTTA GTCGAGGTTA AAAAAGCTCT
      CGGAGCCACG TGTACGAAAT GTACACAAAT CAGCTCCAAT TTTTTCGAGA
-------------------------------------------------------------------

3601  AGGCCCCCCG AACCACGGGG ACGTGGTTTT CCTTTGAAAA ACACGATGAT
      TCCGGGGGGC TTGGTGCCCC TGCACCAAAA GGAAACTTTT TGTGCTACTA
-------------------------------------------------------------------

                      XmaI
                     ~~~~~~
                      SmaI
                     ~~~~~~
      HindIII         AvaI          PstI
      ~~~~~~         ~~~~~~        ~~~~~~~
3651  AAGCTTGCCA CAACCCCGGG ATAATTCCTG CAGCCAATAT GGGATCGGCC
      TTCGAACGGT GTTGGGGCCC TATTAAGGAC GTCGGTTATA CCCTAGCCGG
-------------------------------------------------------------------

3701  ATTGAACAAG ATGGATTGCA CGCAGGTTCT CCGGCCGCTT GGGTGGAGAG
      TAACTTGTTC TACCTAACGT GCGTCCAAGA GGCCGGCGAA CCCACCTCTC
-------------------------------------------------------------------

3751  GCTATTCGGC TATGACTGGG CACAACAGAC AATCGGCTGC TCTGATGCCG
      CGATAAGCCG ATACTGACCC GTGTTGTCTG TTAGCCGACG AGACTACGGC
-------------------------------------------------------------------

3801  CCGTGTTCCG GCTGTCAGCG CAGGGGCGCC CGGTTCTTTT TGTCAAGACC
      GGCACAAGGC CGACAGTCGC GTCCCCGCGG GCCAAGAAAA ACAGTTCTGG
-------------------------------------------------------------------
```

Fig. 16-10

```
                    PstI
                    ~~~~~~
3851  GACCTGTCCG GTGCCCTGAA TGAACTGCAG GACGAGGCAG CGCGGCTATC
      CTGGACAGGC CACGGGACTT ACTTGACGTC CTGCTCCGTC GCGCCGATAG

      ----------|----------|----------|----------|----------|----------

3901  GTGGCTGGCC ACGACGGCGC TTCCTTGCGC AGCTGTGCTC GACGTTGTCA
      CACCGACCGG TGCTGCCCGC AAGGAACGCG TCGACACGAG CTGCAACAGT

      ----------|----------|----------|----------|----------|----------

3951  CTGAAGCGGG AAGGGACTGG CTGCTATTGG GCGAAGTGCC GGGGCAGGAT
      GACTTCGCCC TTCCCTGACC GACGATAACC CGCTTCACGG CCCCGTCCTA

      ----------|----------|----------|----------|----------|----------

4001  CTCCTGTCAT CTCACCTTGC TCCTGCCGAG AAAGTATCCA TCATGGCTGA
      GAGGACAGTA GAGTGGAACG AGGACGGCTC TTTCATAGGT AGTACCGACT

      ----------|----------|----------|----------|----------|----------

4051  TGCAATGCGG CGGCTGCATA CGCTTGATCC GGCTACCTGC CCATTCGACC
      ACGTTACGCC GCCGACGTAT GCGAACTAGG CCGATGGACG GGTAAGCTGG

      ----------|----------|----------|----------|----------|----------

4101  ACCAAGCGAA ACATCGCATC GAGCGAGCAC GTACTCGGAT GGAAGCCGGT
      TGGTTCGCTT TGTAGCGTAG CTCGCTCGTG CATGAGCCTA CCTTCGGCCA

      ----------|----------|----------|----------|----------|----------

4151  CTTGTCGATC AGGATGATCT GGACGAAGAG CATCAGGGGC TCGCGCCAGC
      GAACAGCTAG TCCTACTAGA CCTGCTTCTC GTAGTCCCCG AGCGCGGTCG

      ----------|----------|----------|----------|----------|----------

4201  CGAACTGTTC GCCAGGCTCA AGGCGCGCAT GCCCGACGGC GAGGATCTCG
      GCTTGACAAG CGGTCCGAGT TCCGCGCGTA CGGGCTGCCG CTCCTAGAGC

      ----------|----------|----------|----------|----------|----------
```

Fig. 16-11

NcoI

```
4251  TCGTGACCCA TGGCGATGCC TGCTTGCCGA ATATCATGGT GGAAAATGGC
      AGCACTGGGT ACCGCTACGG ACGAACGGCT TATAGTACCA CCTTTTACCG

4301  CGCTTTTCTG GATTCATCGA CTGTGGCCGG CTGGGTGTGG CGGACCGCTA
      GCGAAAAGAC CTAAGTAGCT GACACCGGCC GACCCACACC GCCTGGCGAT

4351  TCAGGACATA GCGTTGGCTA CCCGTGATAT TGCTGAAGAG CTTGGCGGCG
      AGTCCTGTAT CGCAACCGAT GGGCACTATA ACGACTTCTC GAACCGCCGC

4401  AATGGGCTGA CCGCTTCCTC GTGCTTTACG GTATCGCCGC TCCCGATTCG
      TTACCCGACT GGCGAAGGAG CACGAAATGC CATAGCGGCG AGGGCTAAGC

4451  CAGCGCATCG CCTTCTATCG CCTTCTTGAC GAGTTCTGGT CGAGGCGGAT
      GTCGCGTAGC GGAAGATAGC GGAAGAACTG CTCAAGACCA GCTCCGCCTA

4501  CTGATCAAGA GACAGGATGA GGATCGTTTC GCGCGGGACT CTGGGGTTCG
      GACTAGTTCT CTGTCCTACT CCTAGCAAAG CGCGCCCTGA GACCCCAAGC

4551  ATAAAATAAA AGATTTTATT TAGTCTCCAG AAAAAGGGGG GAATGAAAGA
      TATTTTATTT TCTAAAATAA ATCAGAGGTC TTTTTCCCCC CTTACTTTCT

4601  CCCCACCTGT AGGTTTGGCA AGCTAGCTTA AGTAACGCCA TTTTGCAAGG
      GGGGTGGACA TCCAAACCGT TCGATCGAAT TCATTGCGGT AAAACGTTCC

4651  CATGGAAAAA TACATAACTG AGAATAGAGA AGTTCAGATC AAGGTCAGGA
      GTACCTTTTT ATGTATTGAC TCTTATCTCT TCAAGTCTAG TTCCAGTCCT

4701  ACAGATGGAA CAGCTGAATA TGGGCCAAAC AGGATATCTG TGGTAAGCAG
      TGTCTACCTT GTCGACTTAT ACCCGGTTTG TCCTATAGAC ACCATTCGTC
```

Fig. 16-12

```
4751  TTCCTGCCCC GGCTCAGGGC CAAGAACAGA TGGAACAGCT GAATATGGGC
      AAGGACGGGG CCGAGTCCCG GTTCTTGTCT ACCTTGTCGA CTTATACCCG
-------------------------------------------------------------
4801  CAAACAGGAT ATCTGTGGTA AGCAGTTCCT GCCCCGGCTC AGGGCCAAGA
      GTTTGTCCTA TAGACACCAT TCGTCAAGGA CGGGGCCGAG TCCCGGTTCT
-------------------------------------------------------------
4851  ACAGATGGTC CCCAGATGCG GTCCAGCCCT CAGCAGTTTC TAGAGAACCA
      TGTCTACCAG GGGTCTACGC CAGGTCGGGA GTCGTCAAAG ATCTCTTGGT
-------------------------------------------------------------
4901  TCAGATGTTT CCAGGGTGCC CCAAGGACCT GAAATGACCC TGTGCCTTAT
      AGTCTACAAA GGTCCCACGG GGTTCCTGGA CTTTACTGGG ACACGGAATA
-------------------------------------------------------------
4951  TTGAACTAAC CAATCAGTTC GCTTCTCGCT TCTGTTCGCG CGCTTCTGCT
      AACTTGATTG GTTAGTCAAG CGAAGAGCGA AGACAAGCGC GCGAAGACGA
-------------------------------------------------------------
        AvaI                                        AvaI
       ~~~~~~                                      ~~~~~~
5001  CCCCGAGCTC AATAAAAGAG CCCACAACCC CTCACTCGGG GCGCCAGTCC
      GGGGCTCGAG TTATTTTCTC GGGTGTTGGG GAGTGAGCCC CGCGGTCAGG
-------------------------------------------------------------
                          XmaI
                         ~~~~~~~
                          SmaI
                         ~~~~~~~
                          AvaI
                         ~~~~~~~
5051  TCCGATTGAC TGAGTCGCCC GGGTACCCGT GTATCCAATA AACCCTCTTG
      AGGCTAACTG ACTCAGCGGG CCCATGGGCA CATAGGTTAT TTGGGAGAAC
-------------------------------------------------------------
```

Fig. 16-13

```
5101  CAGTTGCATC CGACTTGTGG TCTCGCTGTT CCTTGGGAGG GTCTCCTCTG
      GTCAACGTAG GCTGAACACC AGAGCGACAA GGAACCCTCC CAGAGGAGAC

      ----------|----------|----------|----------|----------|----------

5151  AGTGATTGAC TACCCGTCAG CGGGGGTCTT TCATTTGGGG GCTCGTCCGG
      TCACTAACTG ATGGGCAGTC GCCCCCAGAA AGTAAACCCC CGAGCAGGCC

      ----------|----------|----------|----------|----------|----------

5201  GATCGGGAGA CCCCTGCCCA GGGACCACCG ACCCACCACC GGGAGGTAAG
      CTAGCCCTCT GGGGACGGGT CCCTGGTGGC TGGGTGGTGG CCCTCCATTC

      ----------|----------|----------|----------|----------|----------

5251  CTGGCTGCCT CGCGCGTTTC GGTGATGACG GTGAAAACCT CTGACACATG
      GACCGACGGA GCGCGCAAAG CCACTACTGC CACTTTTGGA GACTGTGTAC

      ----------|----------|----------|----------|----------|----------

5301  CAGCTCCCGG AGACGGTCAC AGCTTGTCTG TAAGCGGATG CCGGGAGCAG
      GTCGAGGGCC TCTGCCAGTG TCGAACAGAC ATTCGCCTAC GGCCCTCGTC

      ----------|----------|----------|----------|----------|----------

5351  ACAAGCCCGT CAGGGCGCGT CAGCGGGTGT TGGCGGGTGT CGGGGCGCAG
      TGTTCGGGCA GTCCCGCGCA GTCGCCCACA ACCGCCCACA GCCCCGCGTC

      ----------|----------|----------|----------|----------|----------

5401  CCATGACCCA GTCACGTAGC GATAGCGGAG TGTATACTGG CTTAACTATG
      GGTACTGGGT CAGTGCATCG CTATCGCCTC ACATATGACC GAATTGATAC

      ----------|----------|----------|----------|----------|----------
                                ApaLI
                                ~~~~~~
5451  CGGCATCAGA GCAGATTGTA CTGAGAGTGC ACCATATGCG GTGTGAAATA
      GCCGTAGTCT CGTCTAACAT GACTCTCACG TGGTATACGC CACACTTTAT

      ----------|----------|----------|----------|----------|----------

5501  CCGCACAGAT GCGTAAGGAG AAAATACCGC ATCAGGCGCT CTTCCGCTTC
      GGCGTGTCTA CGCATTCCTC TTTTATGGCG TAGTCCGCGA GAAGGCGAAG

      ----------|----------|----------|----------|----------|----------
```

Fig. 16-14

```
5551  CTCGCTCACT GACTCGCTGC GCTCGGTCGT TCGGCTGCGG CGAGCGGTAT
      GAGCGAGTGA CTGAGCGACG CGAGCCAGCA AGCCGACGCC GCTCGCCATA

      ----------|----------|----------|----------|----------|----------|

5601  CAGCTCACTC AAAGGCGGTA ATACGGTTAT CCACAGAATC AGGGGATAAC
      GTCGAGTGAG TTTCCGCCAT TATGCCAATA GGTGTCTTAG TCCCCTATTG

      ----------|----------|----------|----------|----------|----------|

5651  GCAGGAAAGA ACATGTGAGC AAAAGGCCAG CAAAAGGCCA GGAACCGTAA
      CGTCCTTTCT TGTACACTCG TTTTCCGGTC GTTTTCCGGT CCTTGGCATT

      ----------|----------|----------|----------|----------|----------|

5701  AAAGGCCGCG TTGCTGGCGT TTTTCCATAG GCTCCGCCCC CCTGACGAGC
      TTTCCGGCGC AACGACCGCA AAAAGGTATC CGAGGCGGGG GGACTGCTCG

      ----------|----------|----------|----------|----------|----------|

5751  ATCACAAAAA TCGACGCTCA AGTCAGAGGT GGCGAAACCC GACAGGACTA
      TAGTGTTTTT AGCTGCGAGT TCAGTCTCCA CCGCTTTGGG CTGTCCTGAT

      ----------|----------|----------|----------|----------|----------|

5801  TAAAGATACC AGGCGTTTCC CCCTGGAAGC TCCCTCGTGC GCTCTCCTGT
      ATTTCTATGG TCCGCAAAGG GGGACCTTCG AGGGAGCACG CGAGAGGACA

      ----------|----------|----------|----------|----------|----------|

5851  TCCGACCCTG CCGCTTACCG GATACCTGTC CGCCTTTCTC CCTTCGGGAA
      AGGCTGGGAC GGCGAATGGC CTATGGACAG GCGGAAAGAG GGAAGCCCTT

      ----------|----------|----------|----------|----------|----------|

5901  GCGTGGCGCT TTCTCATAGC TCACGCTGTA GGTATCTCAG TTCGGTGTAG
      CGCACCGCGA AAGAGTATCG AGTGCGACAT CCATAGAGTC AAGCCACATC

      ----------|----------|----------|----------|----------|----------|
                                 ApaLI
                                 ------
5951  GTCGTTCGCT CCAAGCTGGG CTGTGTGCAC GAACCCCCCG TTCAGCCCGA
      CAGCAAGCGA GGTTCGACCC GACACACGTG CTTGGGGGGC AAGTCGGGCT

      ----------|----------|----------|----------|----------|----------|
```

Fig. 16-15

```
6001  CCGCTGCGCC TTATCCGGTA ACTATCGTCT TGAGTCCAAC CCGGTAAGAC
      GGCGACGCGG AATAGGCCAT TGATAGCAGA ACTCAGGTTG GGCCATTCTG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6051  ACGACTTATC GCCACTGGCA GCAGCCACTG GTAACAGGAT TAGCAGAGCG
      TGCTGAATAG CGGTGACCGT CGTCGGTGAC CATTGTCCTA ATCGTCTCGC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6101  AGGTATGTAG GCGGTGCTAC AGAGTTCTTG AAGTGGTGGC CTAACTACGG
      TCCATACATC CGCCACGATG TCTCAAGAAC TTCACCACCG GATTGATGCC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6151  CTACACTAGA AGGACAGTAT TTGGTATCTG CGCTCTGCTG AAGCCAGTTA
      GATGTGATCT TCCTGTCATA AACCATAGAC GCGAGACGAC TTCGGTCAAT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6201  CCTTCGGAAA AAGAGTTGGT AGCTCTTGAT CCGGCAAACA AACCACCGCT
      GGAAGCCTTT TTCTCAACCA TCGAGAACTA GGCCGTTTGT TTGGTGGCGA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6251  GGTAGCGGTG GTTTTTTTGT TTGCAAGCAG CAGATTACGC GCAGAAAAAA
      CCATCGCCAC CAAAAAACA AACGTTCGTC GTCTAATGCG CGTCTTTTTT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6301  AGGATCTCAA GAAGATCCTT TGATCTTTTC TACGGGGTCT GACGCTCAGT
      TCCTAGAGTT CTTCTAGGAA ACTAGAAAAG ATGCCCCAGA CTGCGAGTCA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6351  GGAACGAAAA CTCACGTTAA GGGATTTTGG TCATGAGATT ATCAAAAAGG
      CCTTGCTTTT GAGTGCAATT CCCTAAAACC AGTACTCTAA TAGTTTTTCC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

6401  ATCTTCACCT AGATCCTTTT AAATTAAAAA TGAAGTTTTA AATCAATCTA
      TAGAAGTGGA TCTAGGAAAA TTTAATTTTT ACTTCAAAAT TTAGTTAGAT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------
```

Fig. 16-16

```
6451  AAGTATATAT GAGTAAACTT GGTCTGACAG TTACCAATGC TTAATCAGTG
      TTCATATATA CTCATTTGAA CCAGACTGTC AATGGTTACG AATTAGTCAC

6501  AGGCACCTAT CTCAGCGATC TGTCTATTTC GTTCATCCAT AGTTGCCTGA
      TCCGTGGATA GAGTCGCTAG ACAGATAAAG CAAGTAGGTA TCAACGGACT

6551  CTCCCCGTCG TGTAGATAAC TACGATACGG GAGGGCTTAC CATCTGGCCC
      GAGGGGCAGC ACATCTATTG ATGCTATGCC CTCCCGAATG GTAGACCGGG

6601  CAGTGCTGCA ATGATACCGC GAGACCCACG CTCACCGGCT CCAGATTTAT
      GTCACGACGT TACTATGGCG CTCTGGGTGC GAGTGGCCGA GGTCTAAATA

6651  CAGCAATAAA CCAGCCAGCC GGAAGGGCCG AGCGCAGAAG TGGTCCTGCA
      GTCGTTATTT GGTCGGTCGG CCTTCCCGGC TCGCGTCTTC ACCAGGACGT

6701  ACTTTATCCG CCTCCATCCA GTCTATTAAT TGTTGCCGGG AAGCTAGAGT
      TGAAATAGGC GGAGGTAGGT CAGATAATTA ACAACGGCCC TTCGATCTCA

                                                      PstI
                                                      ~~~~~~
6751  AAGTAGTTCG CCAGTTAATA GTTTGCGCAA CGTTGTTGCC ATTGCTGCAG
      TTCATCAAGC GGTCAATTAT CAAACGCGTT GCAACAACGG TAACGACGTC

6801  GCATCGTGGT GTCACGCTCG TCGTTTGGTA TGGCTTCATT CAGCTCCGGT
      CGTAGCACCA CAGTGCGAGC AGCAAACCAT ACCGAAGTAA GTCGAGGCCA

6851  TCCCAACGAT CAAGGCGAGT TACATGATCC CCCATGTTGT GCAAAAAAGC
      AGGGTTGCTA GTTCCGCTCA ATGTACTAGG GGGTACAACA CGTTTTTTCG
```

Fig. 16-17

```
6901  GGTTAGCTCC TTCGGTCCTC CGATCGTTGT CAGAAGTAAG TTGGCCGCAG
      CCAATCGAGG AAGCCAGGAG GCTAGCAACA GTCTTCATTC AACCGGCGTC

      ----------|----------|----------|----------|----------|----------

6951  TGTTATCACT CATGGTTATG GCAGCACTGC ATAATTCTCT TACTGTCATG
      ACAATAGTGA GTACCAATAC CGTCGTGACG TATTAAGAGA ATGACAGTAC

      ----------|----------|----------|----------|----------|----------

7001  CCATCCGTAA GATGCTTTTC TGTGACTGGT GAGTACTCAA CCAAGTCATT
      GGTAGGCATT CTACGAAAAG ACACTGACCA CTCATGAGTT GGTTCAGTAA

      ----------|----------|----------|----------|----------|----------

7051  CTGAGAATAG TGTATGCGGC GACCGAGTTG CTCTTGCCCG GCGTCAACAC
      GACTCTTATC ACATACGCCG CTGGCTCAAC GAGAACGGGC CGCAGTTGTG

      ----------|----------|----------|----------|----------|----------

7101  GGGATAATAC CGCGCCACAT AGCAGAACTT TAAAAGTGCT CATCATTGGA
      CCCTATTATG GCGCGGTGTA TCGTCTTGAA ATTTTCACGA GTAGTAACCT

      ----------|----------|----------|----------|----------|----------

7151  AAACGTTCTT CGGGGCGAAA ACTCTCAAGG ATCTTACCGC TGTTGAGATC
      TTTGCAAGAA GCCCCGCTTT TGAGAGTTCC TAGAATGGCG ACAACTCTAG

      ----------|----------|----------|----------|----------|----------

                          ApaLI
                          ~~~~~~
7201  CAGTTCGATG TAACCCACTC GTGCACCCAA CTGATCTTCA GCATCTTTTA
      GTCAAGCTAC ATTGGGTGAG CACGTGGGTT GACTAGAAGT CGTAGAAAAT

      ----------|----------|----------|----------|----------|----------

7251  CTTTCACCAG CGTTTCTGGG TGAGCAAAAA CAGGAAGGCA AAATGCCGCA
      GAAAGTGGTC GCAAAGACCC ACTCGTTTTT GTCCTTCCGT TTTACGGCGT

      ----------|----------|----------|----------|----------|----------

7301  AAAAAGGGAA TAAGGGCGAC ACGGAAATGT TGAATACTCA TACTCTTCCT
      TTTTTCCCTT ATTCCCGCTG TGCCTTTACA ACTTATGAGT ATGAGAAGGA

      ----------|----------|----------|----------|----------|----------
```

Fig. 16-18

Fig. 16-19

```
7351  TTTTCAATAT TATTGAAGCA TTTATCAGGG TTATTGTCTC ATGAGCGGAT
      AAAAGTTATA ATAACTTCGT AAATAGTCCC AATAACAGAG TACTCGCCTA
      ----------|----------|----------|----------|----------
7401  ACATATTTGA ATGTATTTAG AAAAATAAAC AAATAGGGGT TCCGCGCACA
      TGTATAAACT TACATAAATC TTTTTATTTG TTTATCCCCA AGGCGCGTGT
      ----------|----------|----------|----------|----------
7451  TTTCCCCGAA AAGTGCCACC TGACGTCTAA GAAACCATTA TTATCATGAC
      AAAGGGGCTT TTCACGGTGG ACTGCAGATT CTTTGGTAAT AATAGTACTG
      ----------|----------|----------|----------|----------
7501  ATTAACCTAT AAAAATAGGC GTATCACGAG GCCCTTTCGT CTTCAA
      TAATTGGATA TTTTTATCCG CATAGTGCTC CGGGAAAGCA GAAGTT
      ----------|----------|----------|----------|----------
```

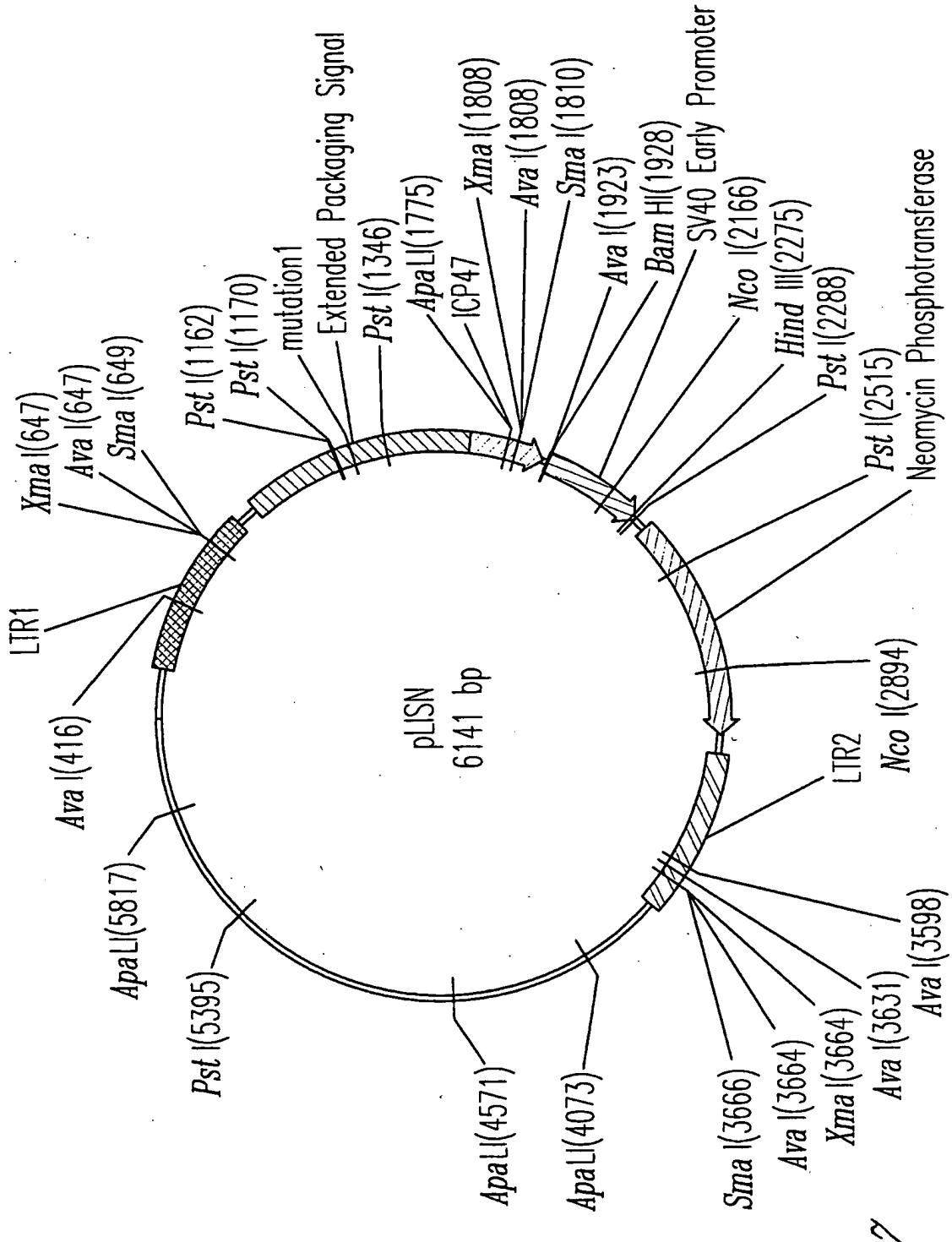
pLISN
6141 bp
LTR1
Xma I(647)
Ava I(647)
Sma I(649)
Ava I(416)
ApaLI(5817)
Pst I(5395)
ApaLI(4571)
ApaLI(4073)
Sma I(3666)
Ava I(3664)
Xma I(3664)
Ava I(3631)
Ava I(3598)
LTR2
Nco I(2894)
Neomycin Phosphotransferase
Pst I(2515)
Pst I(2288)
Hind III(2275)
Nco I(2166)
SV40 Early Promoter
Bam HI(1928)
Ava I(1923)
Sma I(1810)
Ava I(1808)
Xma I(1808)
ApaLI(1775)
ICP47
Pst I(1346)
Extended Packaging Signal
mutation1
Pst I(1170)
Pst I(1162)

Fig. 17

```
  1  GAATTGCTAG CAATTGCTAG CAATTGCTAG CAATTCATAC CAGATCACCG
     CTTAACGATC GTTAACGATC GTTAACGATC GTTAAGTATG GTCTAGTGGC

 51  AAAACTGTCC TCCAAATGTG TCCCCCTCAC ACTCCCAAAT TCGCGGGCTT
     TTTTGACAGG AGGTTTACAC AGGGGGAGTG TGAGGGTTTA AGCGCCCGAA

101  CTGCCTCTTA GACCACTCTA CCCTATTCCC CACACTCACC GGAGCCAAAG
     GACGGAGAAT CTGGTGAGAT GGGATAAGGG GTGTGAGTGG CCTCGGTTTC

151  CCGCGGCCCT TCCGTTTCTT TGCTTTTGAA AGACCCCACC CGTAGGTGGC
     GGCGCCGGGA AGGCAAAGAA ACGAAAACTT TCTGGGGTGG GCATCCACCG

201  AAGCTAGCTT AAGTAACGCC ACTTTGCAAG GCATGGAAAA ATACATAACT
     TTCGATCGAA TTCATTGCGG TGAAACGTTC CGTACCTTTT TATGTATTGA

251  GAGAATAGAA AAGTTCAGAT CAAGGTCAGG AACAAAGAAA CAGCTGAATA
     CTCTTATCTT TTCAAGTCTA GTTCCAGTCC TTGTTTCTTT GTCGACTTAT

301  CCAAACAGGA TATCTGTGGT AAGCGGTTCC TGCCCCGGCT CAGGGCCAAG
     GGTTTGTCCT ATAGACACCA TTCGCCAAGG ACGGGGCCGA GTCCCGGTTC

351  AACAGATGAG ACAGCTGAGT GATGGGCCAA ACAGGATATC TGTGGTAAGC
     TTGTCTACTC TGTCGACTCA CTACCCGGTT TGTCCTATAG ACACCATTCG

                       AvaI
                       ~~~~~~
401  AGTTCCTGCC CCGGCTCGGG GCCAAGAACA GATGGTCCCC AGATGCGGTC
     TCAAGGACGG GGCCGAGCCC CGGTTCTTGT CTACCAGGGG TCTACGCCAG
```

Fig. 18-1

```
451  CAGCCCTCAG CAGTTTCTAG TGAATCATCA GATGTTTCCA GGGTGCCCCA
     GTCGGGAGTC GTCAAAGATC ACTTAGTAGT CTACAAAGGT CCCACGGGGT

     ----------|----------|----------|----------|----------|----------

501  AGGACCTGAA AATGACCCTG TACCTTATTT GAACTAACCA ATCAGTTCGC
     TCCTGGACTT TTACTGGGAC ATGGAATAAA CTTGATTGGT TAGTCAAGCG

     ----------|----------|----------|----------|----------|----------

551  TTCTCGCTTC TGTTCGCGCG CTTCCGCTCT CCGAGCTCAA TAAAAGAGCC
     AAGAGCGAAG ACAAGCGCGC GAAGGCGAGA GGCTCGAGTT ATTTTCTCGG

     ----------|----------|----------|----------|----------|----------

                                                  XmaI
                                                  ~~~~~
                                                  SmaI
                                                  ~~~~~
                                                  AvaI
                                                  ~~~~~
601  CACAACCCCT CACTCGGCGC GCCAGTCTTC CGATAGACTG CGTCGCCCGG
     GTGTTGGGGA GTGAGCCGCG CGGTCAGAAG GCTATCTGAC GCAGCGGGCC

     ----------|----------|----------|----------|----------|----------

     XmaI
     ~
     SmaI
     ~
     AvaI
     ~
651  GTACCCGTAT TCCCAATAAA GCCTCTTGCT GTTTGCATCC GAATCGTGGT
     CATGGGCATA AGGGTTATTT CGGAGAACGA CAAACGTAGG CTTAGCACCA

     ----------|----------|----------|----------|----------|----------

701  CTCGCTGTTC CTTGGGAGGG TCTCCTCTGA GTGATTGACT ACCCACGACG
     GAGCGACAAG GAACCCTCCC AGAGGAGACT CACTAACTGA TGGGTGCTGC

     ----------|----------|----------|----------|----------|----------
```

Fig. 18-2

```
751  GGGGTCTTTC ATTTGGGGGC TCGTCCGGGA TTTGGAGACC CCTGCCCAGG
     CCCCAGAAAG TAAACCCCCG AGCAGGCCCT AAACCTCTGG GGACGGGTCC
-----------------------------------------------------------
801  GACCACCGAC CCACCACCGG GAGGTAAGCT GGCCAGCAAC TTATCTGTGT
     CTGGTGGCTG GGTGGTGGCC CTCCATTCGA CCGGTCGTTG AATAGACACA
-----------------------------------------------------------
851  CTGTCCGATT GTCTAGTGTC TATGTTTGAT GTTATGCGCC TGCGTCTGTA
     GACAGGCTAA CAGATCACAG ATACAAACTA CAATACGCGG ACGCAGACAT
-----------------------------------------------------------
901  CTAGTTAGCT AACTAGCTCT GTATCTGGCG GACCCGTGGT GGAACTGACG
     GATCAATCGA TTGATCGAGA CATAGACCGC CTGGGCACCA CCTTGACTGC
-----------------------------------------------------------
951  AGTTCTGAAC ACCCGGCCGC AACCCTGGGA GACGTCCCAG GGACTTTGGG
     TCAAGACTTG TGGGCCGGCG TTGGGACCCT CTGCAGGGTC CCTGAAACCC
-----------------------------------------------------------
1001 GGCCGTTTTT GTGGCCCGAC CTGAGGAAGG GAGTCGATGT GGAATCCGAC
     CCGGCAAAAA CACCGGGCTG GACTCCTTCC CTCAGCTACA CCTTAGGCTG
-----------------------------------------------------------
1051 CCCGTCAGGA TATGTGGTTC TGGTAGGAGA CGAGAACCTA AAACAGTTCC
     GGGCAGTCCT ATACACCAAG ACCATCCTCT GCTCTTGGAT TTTGTCAAGG
-----------------------------------------------------------
1101 CGCCTCCGTC TGAATTTTTG CTTTCGGTTT GGAACCGAAG CCGCGCGTCT
     GCGGAGGCAG ACTTAAAAAC GAAAGCCAAA CCTTGGCTTC GGCGCGCAGA
-----------------------------------------------------------
              PstI      PstI
             ~~~~~~~   ~~~~~~
1151 TGTCTGCTGC AGCGCTGCAG CATCGTTCTG TGTTGTCTCT GTCTGACTGT
     ACAGACGACG TCGCGACGTC GTAGCAAGAC ACAACAGAGA CAGACTGACA
-----------------------------------------------------------
```

Fig. 18-3

```
1201  GTTTCTGTAT TTGTCTGAAA ATTAGGGCCA GACTGTTACC ACTCCCTTAA
      CAAAGACATA AACAGACTTT TAATCCCGGT CTGACAATGG TGAGGGAATT

1251  GTTTGACCTT AGGTCACTGG AAAGATGTCG AGCGGATCGC TCACAACCAG
      CAAACTGGAA TCCAGTGACC TTTCTACAGC TCGCCTAGCG AGTGTTGGTC

                                                    PstI
                                                    ~~~~~~
1301  TCGGTAGATG TCAAGAAGAG ACGTTGGGTT ACCTTCTGCT CTGCAGAATG
      AGCCATCTAC AGTTCTTCTC TGCAACCCAA TGGAAGACGA GACGTCTTAC

1351  GCCAACCTTT AACGTCGGAT GGCCGCGAGA CGGCACCTTT AACCGAGACC
      CGGTTGGAAA TTGCAGCCTA CCGGCGCTCT GCCGTGGAAA TTGGCTCTGG

1401  TCATCACCCA GGTTAAGATC AAGGTCTTTT CACCTGGCCC GCATGGACAC
      AGTAGTGGGT CCAATTCTAG TTCCAGAAAA GTGGACCGGG CGTACCTGTG

1451  CCAGACCAGG TCCCCTACAT CGTGACCTGG GAAGCCTTGG CTTTTGACCC
      GGTCTGGTCC AGGGGATGTA GCACTGGACC CTTCGGAACC GAAAACTGGG

1501  CCCTCCCTGG GTCAAGCCCT TTGTACACCC TAAGCCTCCG CCTCCTCTTC
      GGGAGGGACC CAGTTCGGGA AACATGTGGG ATTCGGAGGC GGAGGAGAAG

1551  CTCCATCCGC CCCGTCTCTC CCCCTTGAAC CTCCTCGTTC GACCCCGCCT
      GAGGTAGGCG GGGCAGAGAG GGGGAACTTG GAGGAGCAAG CTGGGGCGGA

1601  CGATCCTCCC TTTATCCAGC CCTCACTCCT TCTCTAGGCG CCGGATGTCG
      GCTAGGAGGG AAATAGGTCG GGAGTGAGGA AGAGATCCGC GGCCTACAGC
```

Fig. 18-4

```
1651  TGGGCCCTGG AAATGGCGGA CACCTTCCTG GACACCATGC GGGTTGGGCC
      ACCCGGGACC TTTACCGCCT GTGGAAGGAC CTGTGGTACG CCCAACCCGG
-------------------------------------------------------------------

1701  CAGGACGTAC GCCGACGTAC GCGATGAGAT CAATAAAAGG GGGCGTGAGG
      GTCCTGCATG CGGCTGCATG CGCTACTCTA GTTATTTTCC CCCGCACTCC
-------------------------------------------------------------------

                                  ApaLI
                                  ~~~~~~
1751  ACCGGGAGGC GGCCAGAACC GCCGTGCACG ACCCGGAGCG TCCCCTGCTG
      TGGCCCTCCG CCGGTCTTGG CGGCACGTGC TGGGCCTCGC AGGGGACGAC
-------------------------------------------------------------------

            XmaI
            ~~~~~~~
            SmaI
            ~~~~~~~
            AvaI
            ~~~~~~~
1801  CGCTCTCCCG GGCTGCTGCC CGAAATCGCC CCCAACGCAT CCTTGGGTGT
      GCGAGAGGGC CCGACGACGG GCTTTAGCGG GGGTTGCGTA GGAACCCACA
-------------------------------------------------------------------

1851  GGCACATCGA AGAACCGGCG GGACCGTGAC CGACAGTCCC CGTAATCCGG
      CCGTGTAGCT TCTTGGCCGC CCTGGCACTG GCTGTCAGGG GCATTAGGCC
-------------------------------------------------------------------

                                  BamHI
                                  ~~~~~~~
                                AvaI
                                ~~~~~~
1901  TAACCCGTTG AAATTCGTTA ACTCGAGGAT CCGGCTGTGG AATGTGTGTC
      ATTGGGCAAC TTTAAGCAAT TGAGCTCCTA GGCCGACACC TTACACACAG
-------------------------------------------------------------------
```

Fig. 18-5

```
1951  AGTTAGGGTG TGGAAAGTCC CCAGGCTCCC CAGCAGGCAG AAGTATGCAA
      TCAATCCCAC ACCTTTCAGG GGTCCGAGGG GTCGTCCGTC TTCATACGTT

      ----------|----------|----------|----------|----------|----------
2001  AGCATGCATC TCAATTAGTC AGCAACCAGG TGTGGAAAGT CCCCAGGCTC
      TCGTACGTAG AGTTAATCAG TCGTTGGTCC ACACCTTTCA GGGGTCCGAG

      ----------|----------|----------|----------|----------|----------
2051  CCCAGCAGGC AGAAGTATGC AAAGCATGCA TCTCAATTAG TCAGCAACCA
      GGGTCGTCCG TCTTCATACG TTTCGTACGT AGAGTTAATC AGTCGTTGGT

      ----------|----------|----------|----------|----------|----------
2101  TAGTCCCGCC CCTAACTCCG CCCATCCCGC CCCTAACTCC GCCCAGTTCC
      ATCAGGGCGG GGATTGAGGC GGGTAGGGCG GGGATTGAGG CGGGTCAAGG

      ----------|----------|----------|----------|----------|----------
                      NcoI
                      ~~~~~~
2151  GCCCATTCTC CGCCCCATGG CTGACTAATT TTTTTTATTT ATGCAGAGGC
      CGGGTAAGAG GCGGGGTACC GACTGATTAA AAAAATAAA TACGTCTCCG

      ----------|----------|----------|----------|----------|----------
2201  CGAGGCCGCC TCGGCCTCTG AGCTATTCCA GAAGTAGTGA GGAGGCTTTT
      GCTCCGGCGG AGCCGGAGAC TCGATAAGGT CTTCATCACT CCTCCGAAAA

      ----------|----------|----------|----------|----------|----------
                                HindIII    PstI
                                ~~~~~~     ~~~~~~
2251  TTGGAGGCCT AGGCTTTTGC AAAAAGCTTG GGCTGCAGGT CGAGGCGGAT
      AACCTCCGGA TCCGAAAACG TTTTTCGAAC CCGACGTCCA GCTCCGCCTA

      ----------|----------|----------|----------|----------|----------
2301  CTGATCAAGA GACAGGATGA GGATCGTTTC GCATGATTGA ACAAGATGGA
      GACTAGTTCT CTGTCCTACT CCTAGCAAAG CGTACTAACT TGTTCTACCT

      ----------|----------|----------|----------|----------|----------
```

Fig. 18-6

```
2351  TTGCACGCAG GTTCTCCGGC CGCTTGGGTG GAGAGGCTAT TCGGCTATGA
      AACGTGCGTC CAAGAGGCCG GCGAACCCAC CTCTCCGATA AGCCGATACT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2401  CTGGGCACAA CAGACAATCG GCTGCTCTGA TGCCGCCGTG TTCCGGCTGT
      GACCCGTGTT GTCTGTTAGC CGACGAGACT ACGGCGGCAC AAGGCCGACA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2451  CAGCGCAGGG GCGCCCGGTT CTTTTTGTCA AGACCGACCT GTCCGGTGCC
      GTCGCGTCCC CGCGGGCCAA GAAAAACAGT TCTGGCTGGA CAGGCCACGG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

                      PstI
                      ~~~~~~
2501  CTGAATGAAC TGCAGGACGA GGCAGCGCGG CTATCGTGGC TGGCCACGAC
      GACTTACTTG ACGTCCTGCT CCGTCGCGCC GATAGCACCG ACCGGTGCTG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2551  GGGCGTTCCT TGCGCAGCTG TGCTCGACGT TGTCACTGAA GCGGGAAGGG
      CCCGCAAGGA ACGCGTCGAC ACGAGCTGCA ACAGTGACTT CGCCCTTCCC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2601  ACTGGCTGCT ATTGGGCGAA GTGCCGGGGC AGGATCTCCT GTCATCTCAC
      TGACCGACGA TAACCCGCTT CACGGCCCCG TCCTAGAGGA CAGTAGAGTG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2651  CTTGCTCCTG CCGAGAAAGT ATCCATCATG GCTGATGCAA TGCGGCGGCT
      GAACGAGGAC GGCTCTTTCA TAGGTAGTAC CGACTACGTT ACGCCGCCGA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2701  GCATACGCTT GATCCGGCTA CCTGCCCATT CGACCACCAA GCGAACATC
      CGTATGCGAA CTAGGCCGAT GGACGGGTAA GCTGGTGGTT CGCTTTGTAG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

2751  GCATCGAGCG AGCACGTACT CGGATGGAAG CCGGTCTTGT CGATCAGGAT
      CGTAGCTCGC TCGTGCATGA GCCTACCTTC GGCCAGAACA GCTAGTCCTA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------
```

Fig. 18-7

```
2801  GATCTGGACG AAGAGCATCA GGGGCTCGCG CCAGCCGAAC TGTTCGCCAG
      CTAGACCTGC TTCTCGTAGT CCCCGAGCGC GGTCGGCTTG ACAAGCGGTC
      ----------------------------------------------------

                                  NcoI
                                  ~~~~~~
2851  GCTCAAGGCG CGCATGCCCG ACGGCGAGGA TCTCGTCGTG ACCCATGGCG
      CGAGTTCCGC GCGTACGGGC TGCCGCTCCT AGAGCAGCAC TGGGTACCGC
      ----------------------------------------------------

2901  ATGCCTGCTT GCCGAATATC ATGGTGGAAA ATGGCCGCTT TTCTGGATTC
      TACGGACGAA CGGCTTATAG TACCACCTTT TACCGGCGAA AAGACCTAAG
      ----------------------------------------------------

2951  ATCGACTGTG GCCGGCTGGG TGTGGCGGAC CGCTATCAGG ACATAGCGTT
      TAGCTGACAC CGGCCGACCC ACACCGCCTG GCGATAGTCC TGTATCGCAA
      ----------------------------------------------------

3001  GGCTACCCGT GATATTGCTG AAGAGCTTGG CGGCGAATGG GCTGACCGCT
      CCGATGGGCA CTATAACGAC TTCTCGAACC GCCGCTTACC CGACTGGCGA
      ----------------------------------------------------

3051  TCCTCGTGCT TTACGGTATC GCCGCTCCCG ATTCGCAGCG CATCGCCTTC
      AGGAGCACGA AATGCCATAG CGGCGAGGGC TAAGCGTCGC GTAGCGGAAG
      ----------------------------------------------------

3101  TATCGCCTTC TTGACGAGTT CTTCTGAGCG GGACTCTGGG GTTCGATAAA
      ATAGCGGAAG AACTGCTCAA GAAGACTCGC CCTGAGACCC CAAGCTATTT
      ----------------------------------------------------

3151  ATAAAAGATT TTATTTAGTC TCCAGAAAAA GGGGGGAATG AAAGACCCCA
      TATTTTCTAA AATAAATCAG AGGTCTTTTT CCCCCCTTAC TTTCTGGGGT
      ----------------------------------------------------

3201  CCTGTAGGTT TGGCAAGCTA GCTTAAGTAA CGCCATTTTG CAAGGCATGG
      GGACATCCAA ACCGTTCGAT CGAATTCATT GCGGTAAAAC GTTCCGTACC
      ----------------------------------------------------
```

Fig. 18-8

```
3251  AAAAATACAT AACTGAGAAT AGAGAAGTTC AGATCAAGGT CAGGAACAGA
      TTTTTATGTA TTGACTCTTA TCTCTTCAAG TCTAGTTCCA GTCCTTGTCT

3301  TGGAACAGCT GAATATGGGC CAAACAGGAT ATCTGTGGTA AGCAGTTCCT
      ACCTTGTCGA CTTATACCCG GTTTGTCCTA TAGACACCAT TCGTCAAGGA

3351  GCCCCGGCTC AGGGCCAAGA ACAGATGGAA CAGCTGAATA TGGGCCAAAC
      CGGGGCCGAG TCCCGGTTCT TGTCTACCTT GTCGACTTAT ACCCGGTTTG

3401  AGGATATCTG TGGTAAGCAG TTCCTGCCCC GGCTCAGGGC CAAGAACAGA
      TCCTATAGAC ACCATTCGTC AAGGACGGGG CCGAGTCCCG GTTCTTGTCT

3451  TGGTCCCCAG ATGCGGTCCA GCCCTCAGCA GTTTCTAGAG AACCATCAGA
      ACCAGGGGTC TACGCCAGGT CGGGAGTCGT CAAAGATCTC TTGGTAGTCT

3501  TGTTTCCAGG GTGCCCCAAG GACCTGAAAT GACCCTGTGC CTTATTTGAA
      ACAAAGGTCC CACGGGGTTC CTGGACTTTA CTGGGACACG GAATAAACTT

                                                      AvaI
                                                      ~~~~
3551  CTAACCAATC AGTTCGCTTC TCGCTTCTGT TCGCGCGCTT CTGCTCCCCG
      GATTGGTTAG TCAAGCGAAG AGCGAAGACA AGCGCGCGAA GACGAGGGGC

      AvaI                                  AvaI
      ~~                                    ~~~~~~~
3601  AGCTCAATAA AAGAGCCCAC AACCCCTCAC TCGGGGCGCC AGTCCTCCGA
      TCGAGTTATT TTCTCGGGTG TTGGGGAGTG AGCCCCGCGG TCAGGAGGCT
```

Fig. 18-9

```
      XmaI
      ~~~~~~
       SmaI
       ~~~~~~
        AvaI
        ~~~~~~
3651  TTGACTGAGT CGCCCGGGTA CCCGTGTATC CAATAACCC TCTTGCAGTT
      AACTGACTCA GCGGGCCCAT GGGCACATAG GTTATTTGGG AGAACGTCAA

      ----------|----------|----------|----------|----------|----------|
3701  GCATCCGACT TGTGGTCTCG CTGTTCCTTG GGAGGGTCTC CTCTGAGTGA
      CGTAGGCTGA ACACCAGAGC GACAAGGAAC CCTCCCAGAG GAGACTCACT

      ----------|----------|----------|----------|----------|----------|
3751  TTGACTACCC GTCAGCGGGG GTCTTTCATT TGGGGGCTCG TCCGGGATCG
      AACTGATGGG CAGTCGCCCC CAGAAAGTAA ACCCCCGAGC AGGCCCTAGC

      ----------|----------|----------|----------|----------|----------|
3801  GGAGACCCCT GCCCAGGGAC CACCGACCCA CCACCGGGAG GTAAGCTGGC
      CCTCTGGGGA CGGGTCCCTG GTGGCTGGGT GGTGGCCCTC CATTCGACCG

      ----------|----------|----------|----------|----------|----------|
3851  TGCCTCGCGC GTTTCGGTGA TGACGGTGAA AACCTCTGAC ACATGCAGCT
      ACGGAGCGCG CAAAGCCACT ACTGCCACTT TTGGAGACTG TGTACGTCGA

      ----------|----------|----------|----------|----------|----------|
3901  CCCGGAGACG GTCACAGCTT GTCTGTAAGC GGATGCCGGG AGCAGACAAG
      GGGCCTCTGC CAGTGTCGAA CAGACATTCG CCTACGGCCC TCGTCTGTTC

      ----------|----------|----------|----------|----------|----------|
3951  CCCGTCAGGG CGCGTCAGCG GGTGTTGGCG GGTGTCGGGG CGCAGCCATG
      GGGCAGTCCC GCGCAGTCGC CCACAACCGC CCACAGCCCC GCGTCGGTAC

      ----------|----------|----------|----------|----------|----------|
4001  ACCCAGTCAC GTAGCGATAG CGGAGTGTAT ACTGGCTTAA CTATGCGGCA
      TGGGTCAGTG CATCGCTATC GCCTCACATA TGACCGAATT GATACGCCGT

      ----------|----------|----------|----------|----------|----------|
```

Fig. 18-10

```
                    ApaLI
                    ~~~~~~
4051  TCAGAGCAGA TTGTACTGAG AGTGCACCAT ATGCGGTGTG AAATACCGCA
      AGTCTCGTCT AACATGACTC TCACGTGGTA TACGCCACAC TTTATGGCGT

      ----------|----------|----------|----------|----------|----------|
4101  CAGATGCGTA AGGAGAAAAT ACCGCATCAG GCGCTCTTCC GCTTCCTCGC
      GTCTACGCAT TCCTCTTTTA TGGCGTAGTC CGCGAGAAGG CGAAGGAGCG

      ----------|----------|----------|----------|----------|----------|
4151  TCACTGACTC GCTGCGCTCG GTCGTTCGGC TGCGGCGAGC GGTATCAGCT
      AGTGACTGAG CGACGCGAGC CAGCAAGCCG ACGCCGCTCG CCATAGTCGA

      ----------|----------|----------|----------|----------|----------|
4201  CACTCAAAGG CGGTAATACG GTTATCCACA GAATCAGGGG ATAACGCAGG
      GTGAGTTTCC GCCATTATGC CAATAGGTGT CTTAGTCCCC TATTGCGTCC

      ----------|----------|----------|----------|----------|----------|
4251  AAAGAACATG TGAGCAAAAG GCCAGCAAAA GGCCAGGAAC CGTAAAAAGG
      TTTCTTGTAC ACTCGTTTTC CGGTCGTTTT CCGGTCCTTG GCATTTTTCC

      ----------|----------|----------|----------|----------|----------|
4301  CCGCGTTGCT GGCGTTTTTC CATAGGCTCC GCCCCCCTGA CGAGCATCAC
      GGCGCAACGA CCGCAAAAAG GTATCCGAGG CGGGGGGACT GCTCGTAGTG

      ----------|----------|----------|----------|----------|----------|
4351  AAAAATCGAC GCTCAAGTCA GAGGTGGCGA AACCCGACAG GACTATAAAG
      TTTTTAGCTG CGAGTTCAGT CTCCACCGCT TTGGGCTGTC CTGATATTTC

      ----------|----------|----------|----------|----------|----------|
4401  ATACCAGGCG TTTCCCCCTG GAAGCTCCCT CGTGCGCTCT CCTGTTCCGA
      TATGGTCCGC AAAGGGGGAC CTTCGAGGGA GCACGCGAGA GGACAAGGCT

      ----------|----------|----------|----------|----------|----------|
4451  CCCTGCCGCT TACCGGATAC CTGTCCGCCT TTCTCCCTTC GGGAAGCGTG
      GGGACGGCGA ATGGCCTATG GACAGGCGGA AAGAGGGAAG CCCTTCGCAC

      ----------|----------|----------|----------|----------|----------|
```

Fig. 18-11

```
4501  GCGCTTTCTC ATAGCTCACG CTGTAGGTAT CTCAGTTCGG TGTAGGTCGT
      CGCGAAAGAG TATCGAGTGC GACATCCATA GAGTCAAGCC ACATCCAGCA
-------------------------------------------------------------

                          ApaLI
                          ~~~~~~~
4551  TCGCTCCAAG CTGGGCTGTG TGCACGAACC CCCCGTTCAG CCCGACCGCT
      AGCGAGGTTC GACCCGACAC ACGTGCTTGG GGGGCAAGTC GGGCTGGCGA
-------------------------------------------------------------

4601  GCGCCTTATC CGGTAACTAT CGTCTTGAGT CCAACCCGGT AAGACACGAC
      CGCGGAATAG GCCATTGATA GCAGAACTCA GGTTGGGCCA TTCTGTGCTG
-------------------------------------------------------------

4651  TTATCGCCAC TGGCAGCAGC CACTGGTAAC AGGATTAGCA GAGCGAGGTA
      AATAGCGGTG ACCGTCGTCG GTGACCATTG TCCTAATCGT CTCGCTCCAT
-------------------------------------------------------------

4701  TGTAGGCGGT GCTACAGAGT TCTTGAAGTG GTGGCCTAAC TACGGCTACA
      ACATCCGCCA CGATGTCTCA AGAACTTCAC CACCGGATTG ATGCCGATGT
-------------------------------------------------------------

4751  CTAGAAGGAC AGTATTTGGT ATCTGCGCTC TGCTGAAGCC AGTTACCTTC
      GATCTTCCTG TCATAAACCA TAGACGCGAG ACGACTTCGG TCAATGGAAG
-------------------------------------------------------------

4801  GGAAAAAGAG TTGGTAGCTC TTGATCCGGC AAACAAACCA CCGCTGGTAG
      CCTTTTTCTC AACCATCGAG AACTAGGCCG TTTGTTTGGT GGCGACCATC
-------------------------------------------------------------

4851  CGGTGGTTTT TTTGTTTGCA AGCAGCAGAT TACGCGCAGA AAAAAAGGAT
      GCCACCAAAA AAACAAACGT TCGTCGTCTA ATGCGCGTCT TTTTTTCCTA
-------------------------------------------------------------

4901  CTCAAGAAGA TCCTTTGATC TTTTCTACGG GGTCTGACGC TCAGTGGAAC
      GAGTTCTTCT AGGAAACTAG AAAAGATGCC CCAGACTGCG AGTCACCTTG
-------------------------------------------------------------
```

Fig. 18-12

```
4951  GAAAACTCAC GTTAAGGGAT TTTGGTCATG AGATTATCAA AAAGGATCTT
      CTTTTGAGTG CAATTCCCTA AAACCAGTAC TCTAATAGTT TTTCCTAGAA

5001  CACCTAGATC CTTTTAAATT AAAAATGAAG TTTTAAATCA ATCTAAAGTA
      GTGGATCTAG GAAAATTTAA TTTTTACTTC AAAATTTAGT TAGATTTCAT

5051  TATATGAGTA AACTTGGTCT GACAGTTACC AATGCTTAAT CAGTGAGGCA
      ATATACTCAT TTGAACCAGA CTGTCAATGG TTACGAATTA GTCACTCCGT

5101  CCTATCTCAG CGATCTGTCT ATTTCGTTCA TCCATAGTTG CCTGACTCCC
      GGATAGAGTC GCTAGACAGA TAAAGCAAGT AGGTATCAAC GGACTGAGGG

5151  CGTCGTGTAG ATAACTACGA TACGGGAGGG CTTACCATCT GGCCCCAGTG
      GCAGCACATC TATTGATGCT ATGCCCTCCC GAATGGTAGA CCGGGGTCAC

5201  CTGCAATGAT ACCGCGAGAC CCACGCTCAC CGGCTCCAGA TTTATCAGCA
      GACGTTACTA TGGCGCTCTG GGTGCGAGTG GCCGAGGTCT AAATAGTCGT

5251  ATAAACCAGC CAGCCGGAAG GGCCGAGCGC AGAAGTGGTC CTGCAACTTT
      TATTTGGTCG GTCGGCCTTC CCGGCTCGCG TCTTCACCAG GACGTTGAAA

5301  ATCCGCCTCC ATCCAGTCTA TTAATTGTTG CCGGGAAGCT AGAGTAAGTA
      TAGGCGGAGG TAGGTCAGAT AATTAACAAC GGCCCTTCGA TCTCATTCAT

                                                  PstI
                                                  ~~~~~~~
5351  GTTCGCCAGT TAATAGTTTG CGCAACGTTG TTGCCATTGC TGCAGGCATC
      CAAGCGGTCA ATTATCAAAC GCGTTGCAAC AACGGTAACG ACGTCCGTAG
```

Fig. 18-13

```
5401  GTGGTGTCAC GCTCGTCGTT TGGTATGGCT TCATTCAGCT CCGGTTCCCA
      CACCACAGTG CGAGCAGCAA ACCATACCGA AGTAAGTCGA GGCCAAGGGT

      ----------|----------|----------|----------|----------|----------

5451  ACGATCAAGG CGAGTTACAT GATCCCCCAT GTTGTGCAAA AAAGCGGTTA
      TGCTAGTTCC GCTCAATGTA CTAGGGGGTA CAACACGTTT TTTCGCCAAT

      ----------|----------|----------|----------|----------|----------

5501  GCTCCTTCGG TCCTCCGATC GTTGTCAGAA GTAAGTTGGC CGCAGTGTTA
      CGAGGAAGCC AGGAGGCTAG CAACAGTCTT CATTCAACCG GCGTCACAAT

      ----------|----------|----------|----------|----------|----------

5551  TCACTCATGG TTATGGCAGC ACTGCATAAT TCTCTTACTG TCATGCCATC
      AGTGAGTACC AATACCGTCG TGACGTATTA AGAGAATGAC AGTACGGTAG

      ----------|----------|----------|----------|----------|----------

5601  CGTAAGATGC TTTTCTGTGA CTGGTGAGTA CTCAACCAAG TCATTCTGAG
      GCATTCTACG AAAAGACACT GACCACTCAT GAGTTGGTTC AGTAAGACTC

      ----------|----------|----------|----------|----------|----------

5651  AATAGTGTAT GCGGCGACCG AGTTGCTCTT GCCCGGCGTC AACACGGGAT
      TTATCACATA CGCCGCTGGC TCAACGAGAA CGGGCCGCAG TTGTGCCCTA

      ----------|----------|----------|----------|----------|----------

5701  AATACCGCGC CACATAGCAG AACTTTAAAA GTGCTCATCA TTGGAAAACG
      TTATGGCGCG GTGTATCGTC TTGAAATTTT CACGAGTAGT AACCTTTTGC

      ----------|----------|----------|----------|----------|----------

5751  TTCTTCGGGG CGAAAACTCT CAAGGATCTT ACCGCTGTTG AGATCCAGTT
      AAGAAGCCCC GCTTTTGAGA GTTCCTAGAA TGGCGACAAC TCTAGGTCAA

      ----------|----------|----------|----------|----------|----------
                      ApaLI
                      ======

5801  CGATGTAACC CACTCGTGCA CCCAACTGAT CTTCAGCATC TTTTACTTTC
      GCTACATTGG GTGAGCACGT GGGTTGACTA GAAGTCGTAG AAAATGAAAG

      ----------|----------|----------|----------|----------|----------
```

Fig. 18-14

```
5851  ACCAGCGTTT CTGGGTGAGC AAAAACAGGA AGGCAAAATG CCGCAAAAAA
      TGGTCGCAAA GACCCACTCG TTTTTGTCCT TCCGTTTTAC GGCGTTTTTT

      ----------|----------|----------|----------|----------|----------

5901  GGGAATAAGG GCGACACGGA AATGTTGAAT ACTCATACTC TTCCTTTTTC
      CCCTTATTCC CGCTGTGCCT TTACAACTTA TGAGTATGAG AAGGAAAAAG

      ----------|----------|----------|----------|----------|----------

5951  AATATTATTG AAGCATTTAT CAGGGTTATT GTCTCATGAG CGGATACATA
      TTATAATAAC TTCGTAAATA GTCCCAATAA CAGAGTACTC GCCTATGTAT

      ----------|----------|----------|----------|----------|----------

6001  TTTGAATGTA TTTAGAAAAA TAAACAAATA GGGGTTCCGC GCACATTTCC
      AAACTTACAT AAATCTTTTT ATTTGTTTAT CCCCAAGGCG CGTGTAAAGG

      ----------|----------|----------|----------|----------|----------

6051  CCGAAAAGTG CCACCTGACG TCTAAGAAAC CATTATTATC ATGACATTAA
      GGCTTTTCAC GGTGGACTGC AGATTCTTTG GTAATAATAG TACTGTAATT

      ----------|----------|----------|----------|----------|----------

6101  CCTATAAAAA TAGGCGTATC ACGAGGCCCT TTCGTCTTCA A
      GGATATTTTT ATCCGCATAG TGCTCCGGGA AAGCAGAAGT T

      ----------|----------|----------|----------|----------|----------
```

Fig. 18-15

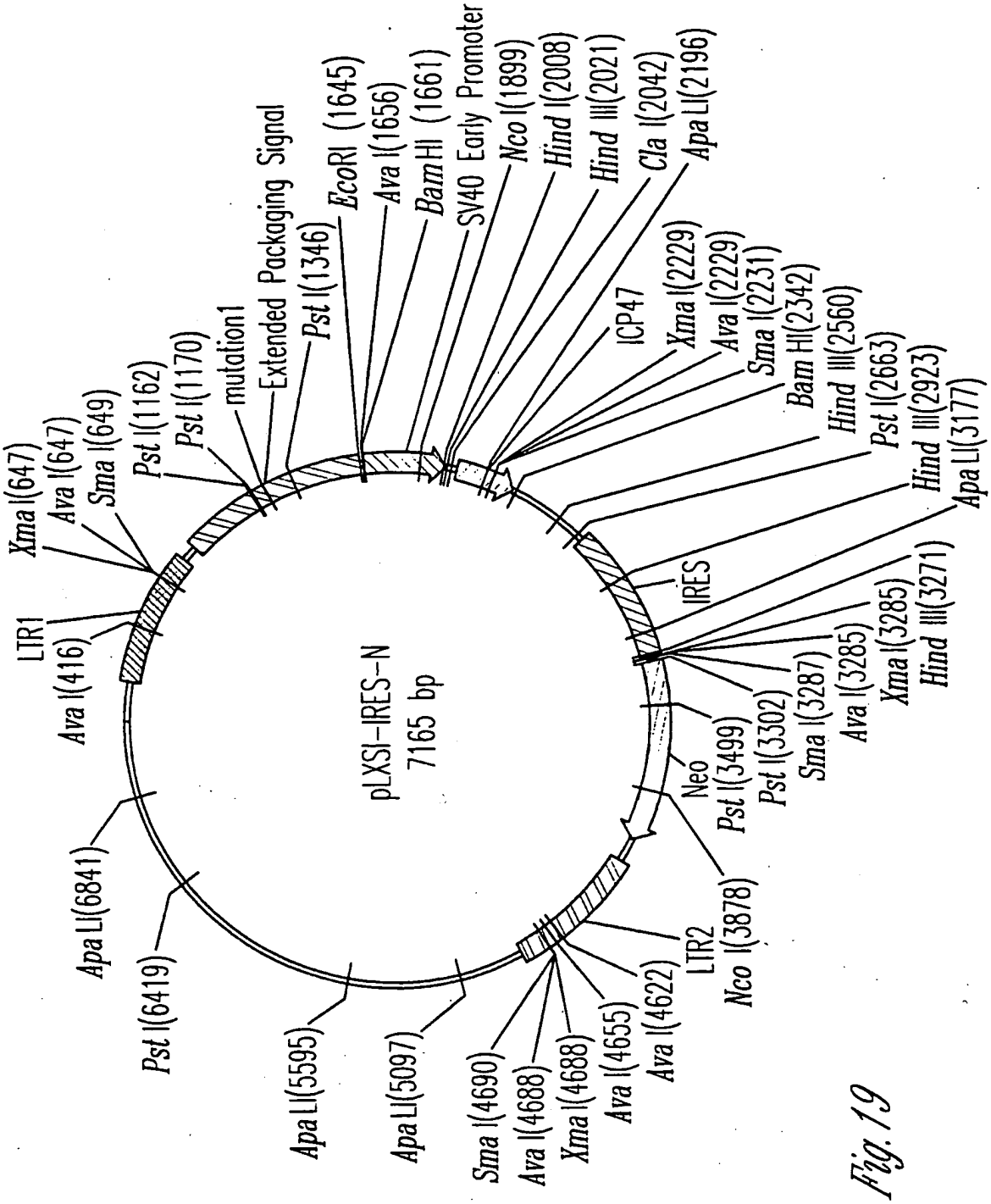
pLXSI-IRES-N
7165 bp
LTR1
Ava I(416)
Apa LI(6841)
Pst I(6419)
Apa LI(5595)
Apa LI(5097)
Sma I(4690)
Ava I(4688)
Xma I(4688)
Ava I(4655)
Ava I(4622)
LTR2
Nco I(3878)
Neo
Pst I(3499)
Pst I(3302)
Sma I(3287)
Ava I(3285)
Xma I(3285)
Hind III(3271)
Apa LI(3177)
Hind III(2923)
Pst I(2663)
Hind III(2560)
Bam HI(2342)
Sma I(2231)
Ava I(2229)
Xma I(2229)
ICP47
Cla I(2042)
Apa LI(2196)
Hind III(2021)
Hind I(2008)
Nco I(1899)
SV40 Early Promoter
BamHI (1661)
Ava I(1656)
EcoRI (1645)
Pst I(1346)
Extended Packaging Signal
mutation1
Pst I(1170)
Pst I(1162)
Sma I(649)
Ava I(647)
Xma I(647)
IRES

Fig. 19

```
1   GAATTGCTAG CAATTGCTAG CAATTGCTAG CAATTCATAC CAGATCACCG
    CTTAACGATC GTTAACGATC GTTAAGTATG GTCTAGTGGC
    ----------|----------|----------|----------|----------
51  AAAACTGTCC TCCAAATGTG TCCCCCTCAC ACTCCCAAAT TCGCGGGCTT
    TTTTGACAGG AGGTTTACAC AGGGGGAGTG TGAGGGTTTA AGCGCCCGAA
    ----------|----------|----------|----------|----------
101 CTGCCTCTTA GACCACTCTA CCCTATTCCC CACACTCACC GGAGCCAAAG
    GACGGAGAAT CTGGTGAGAT GGGATAAGGG GTGTGAGTGG CCTCGGTTTC
    ----------|----------|----------|----------|----------
151 CCGCGGCCCT TCCGTTTCTT TGCTTTTGAA AGACCCCACC CGTAGGTGGC
    GGCGCCGGGA AGGCAAAGAA ACGAAAACTT TCTGGGGTGG GCATCCACCG
    ----------|----------|----------|----------|----------
201 AAGCTAGCTT AAGTAACGCC ACTTTGCAAG GCATGGAAAA ATACATAACT
    TTCGATCGAA TTCATTGCGG TGAAACGTTC CGTACCTTTT TATGTATTGA
    ----------|----------|----------|----------|----------
251 GAGAATAGAA AAGTTCAGAT CAAGGTCAGG AACAAAGAAA CAGCTGAATA
    CTCTTATCTT TTCAAGTCTA GTTCCAGTCC TTGTTTCTTT GTCGACTTAT
    ----------|----------|----------|----------|----------
301 CCAAACAGGA TATCTGTGGT AAGCGGTTCC TGCCCCGGCT CAGGGCCAAG
    GGTTTGTCCT ATAGACACCA TTCGCCAAGG ACGGGGCCGA GTCCCGGTTC
    ----------|----------|----------|----------|----------
351 AACAGATGAG ACAGCTGAGT GATGGGCCAA ACAGGATATC TGTGGTAAGC
    TTGTCTACTC TGTCGACTCA CTACCCGGTT TGTCCTATAG ACACCATTCG
    ----------|----------|----------|----------|----------
                    AvaI
                    ~~~~~~
401 AGTTCCTGCC CCGGCTCGGG GCCAAGAACA GATGGTCCCC AGATGCGGTC
    TCAAGGACGG GGCCGAGCCC CGGTTCTTGT CTACCAGGGG TCTACGCCAG
    ----------|----------|----------|----------|----------
```

Fig. 20-1

```
451  CAGCCCTCAG CAGTTTCTAG TGAATCATCA GATGTTTCCA GGGTGCCCCA
     GTCGGGAGTC GTCAAAGATC ACTTAGTAGT CTACAAAGGT CCCACGGGGT

-------------------------------------------------------------

501  AGGACCTGAA AATGACCCTG TACCTTATTT GAACTAACCA ATCAGTTCGC
     TCCTGGACTT TTACTGGGAC ATGGAATAAA CTTGATTGGT TAGTCAAGCG

-------------------------------------------------------------

551  TTCTCGCTTC TGTTCGCGCG CTTCCGCTCT CCGAGCTCAA TAAAAGAGCC
     AAGAGCGAAG ACAAGCGCGC GAAGGCGAGA GGCTCGAGTT ATTTTCTCGG

-------------------------------------------------------------

                                                  XmaI
                                                  ~~~~~
                                                  SmaI
                                                  ~~~~~
                                                  AvaI
                                                  ~~~~~
601  CACAACCCCT CACTCGGCGC GCCAGTCTTC CGATAGACTG CGTCGCCCGG
     GTGTTGGGGA GTGAGCCGCG CGGTCAGAAG GCTATCTGAC GCAGCGGGCC

-------------------------------------------------------------

     XmaI
     ~
     SmaI
     ~
     AvaI
     ~
651  GTACCCGTAT TCCCAATAAA GCCTCTTGCT GTTTGCATCC GAATCGTGGT
     CATGGGCATA AGGGTTATTT CGGAGAACGA CAAACGTAGG CTTAGCACCA

-------------------------------------------------------------

701  CTCGCTGTTC CTTGGGAGGG TCTCCTCTGA GTGATTGACT ACCCACGACG
     GAGCGACAAG GAACCCTCCC AGAGGAGACT CACTAACTGA TGGGTGCTGC

-------------------------------------------------------------
```

Fig. 20-2

```
751  GGGGTCTTTC ATTTGGGGGC TCGTCCGGGA TTTGGAGACC CCTGCCCAGG
     CCCCAGAAAG TAAACCCCCG AGCAGGCCCT AAACCTCTGG GGACGGGTCC
-----------------------------------------------------------
801  GACCACCGAC CCACCACCGG GAGGTAAGCT GGCCAGCAAC TTATCTGTGT
     CTGGTGGCTG GGTGGTGGCC CTCCATTCGA CCGGTCGTTG AATAGACACA
-----------------------------------------------------------
851  CTGTCCGATT GTCTAGTGTC TATGTTTGAT GTTATGCGCC TGCGTCTGTA
     GACAGGCTAA CAGATCACAG ATACAAACTA CAATACGCGG ACGCAGACAT
-----------------------------------------------------------
901  CTAGTTAGCT AACTAGCTCT GTATCTGGCG GACCCGTGGT GGAACTGACG
     GATCAATCGA TTGATCGAGA CATAGACCGC CTGGGCACCA CCTTGACTGC
-----------------------------------------------------------
951  AGTTCTGAAC ACCCGGCCGC AACCCTGGGA GACGTCCCAG GGACTTTGGG
     TCAAGACTTG TGGGCCGGCG TTGGGACCCT CTGCAGGGTC CCTGAAACCC
-----------------------------------------------------------
1001 GGCCGTTTTT GTGGCCCGAC CTGAGGAAGG GAGTCGATGT GGAATCCGAC
     CCGGCAAAAA CACCGGGCTG GACTCCTTCC CTCAGCTACA CCTTAGGCTG
-----------------------------------------------------------
1051 CCCGTCAGGA TATGTGGTTC TGGTAGGAGA CGAGAACCTA AAACAGTTCC
     GGGCAGTCCT ATACACCAAG ACCATCCTCT GCTCTTGGAT TTTGTCAAGG
-----------------------------------------------------------
1101 CGCCTCCGTC TGAATTTTTG CTTTCGGTTT GGAACCGAAG CCGCGCGTCT
     GCGGAGGCAG ACTTAAAAAC GAAAGCCAAA CCTTGGCTTC GGCGCGCAGA
-----------------------------------------------------------
          PstI      PstI
          ~~~~~~~   ~~~~~~
1151 TGTCTGCTGC AGCGCTGCAG CATCGTTCTG TGTTGTCTCT GTCTGACTGT
     ACAGACGACG TCGCGACGTC GTAGCAAGAC ACAACAGAGA CAGACTGACA
-----------------------------------------------------------
```

Fig.20-3

```
1201  GTTTCTGTAT TTGTCTGAAA ATTAGGGCCA GACTGTTACC ACTCCCTTAA
      CAAAGACATA AACAGACTTT TAATCCCGGT CTGACAATGG TGAGGGAATT

      ----------|----------|----------|----------|----------|----------

1251  GTTTGACCTT AGGTCACTGG AAAGATGTCG AGCGGATCGC TCACAACCAG
      CAAACTGGAA TCCAGTGACC TTTCTACAGC TCGCCTAGCG AGTGTTGGTC

      ----------|----------|----------|----------|----------|----------
                                     PstI
                                     ~~~~~~

1301  TCGGTAGATG TCAAGAAGAG ACGTTGGGTT ACCTTCTGCT CTGCAGAATG
      AGCCATCTAC AGTTCTTCTC TGCAACCCAA TGGAAGACGA GACGTCTTAC

      ----------|----------|----------|----------|----------|----------

1351  GCCAACCTTT AACGTCGGAT GGCCGCGAGA CGGCACCTTT AACCGAGACC
      CGGTTGGAAA TTGCAGCCTA CCGGCGCTCT GCCGTGGAAA TTGGCTCTGG

      ----------|----------|----------|----------|----------|----------

1401  TCATCACCCA GGTTAAGATC AAGGTCTTTT CACCTGGCCC GCATGGACAC
      AGTAGTGGGT CCAATTCTAG TTCCAGAAAA GTGGACCGGG CGTACCTGTG

      ----------|----------|----------|----------|----------|----------

1451  CCAGACCAGG TCCCCTACAT CGTGACCTGG GAAGCCTTGG CTTTTGACCC
      GGTCTGGTCC AGGGGATGTA GCACTGGACC CTTCGGAACC GAAAACTGGG

      ----------|----------|----------|----------|----------|----------

1501  CCCTCCCTGG GTCAAGCCCT TTGTACACCC TAAGCCTCCG CCTCCTCTTC
      GGGAGGGACC CAGTTCGGGA AACATGTGGG ATTCGGAGGC GGAGGAGAAG

      ----------|----------|----------|----------|----------|----------

1551  CTCCATCCGC CCCGTCTCTC CCCCTTGAAC CTCCTCGTTC GACCCCGCCT
      GAGGTAGGCG GGGCAGAGAG GGGGAACTTG GAGGAGCAAG CTGGGGCGGA

      ----------|----------|----------|----------|----------|----------
```

Fig. 20-4

NOT FURNISHED AT TIME OF PUBLICATION

```
1951  CTGAGCTATT CCAGAAGTAG TGAGGAGGCT TTTTTGGAGG CCTAGGCTTT
      GACTCGATAA GGTCTTCATC ACTCCTCCGA AAAAACCTCC GGATCCGAAA
      ----------------------------------------------------
                                                 ClaI
            HindIII                              ~~~~~~~
      2001  TGCAAAAAGC TTGGGCTGCA AGCTTGGTAC CGAGCTCGGA TCGATATCTG
            ACGTTTTTCG AACCCGACGT TCGAACCATG GCTCGAGCCT AGCTATAGAC
      ----------------------------------------------------
      2051  CGGCCGCGTC GACGGATGTC GTGGGCCCTG GAAATGGCGG ACACCTTCCT
            GCCGGCGCAG CTGCCTACAG CACCCGGGAC CTTTACCGCC TGTGGAAGGA
      ----------------------------------------------------
      2101  GGACACCATG CGGGTTGGGC CCAGGACGTA CGCCGACGTA CGCGATGAGA
            CCTGTGGTAC GCCCAACCCG GGTCCTGCAT GCGGCTGCAT GCGCTACTCT
      ----------------------------------------------------
                                                 ApaLI
                                                 ~~~~~~
      2151  TCAATAAAAG GGGGCGTGAG GACCGGGAGG CGGCCAGAAC CGCCGTGCAC
            AGTTATTTTC CCCCGCACTC CTGGCCCTCC GCCGGTCTTG GCGGCACGTG
      ----------------------------------------------------
                              XmaI
                              ~~~~~~
                               SmaI
                              ~~~~~~
                               AvaI
                              ~~~~~~
      2201  GACCCGGAGC GTCCCCTGCT GCGCTCTCCC GGGCTGCTGC CCGAAATCGC
            CTGGGCCTCG CAGGGGACGA CGCGAGAGGG CCCGACGACG GGCTTTAGCG
      ----------------------------------------------------
```

Fig. 20-6

```
2251  CCCCAACGCA TCCTTGGGTG TGGCACATCG AAGAACCGGC GGGACCGTGA
      GGGGTTGCGT AGGAACCCAC ACCGTGTAGC TTCTTGGCCG CCCTGGCACT

      ----------------------------------------------------------

                                        BamHI
                                        ~~~~~~
2301  CCGACAGTCC CCGTAATCCG GTAACCCGTT GAAATTCAGT GGATCCACTA
      GGCTGTCAGG GGCATTAGGC CATTGGGCAA CTTTAAGTCA CCTAGGTGAT

      ----------------------------------------------------------

2351  GTAACGGCCG CCAGTGTGCT GGAATTAATT CGCTGTCTGC GAGGGCCGGC
      CATTGCCGGC GGTCACACGA CCTTAATTAA GCGACAGACG CTCCCGGCCG

      ----------------------------------------------------------

2401  TGTTGGGGTG AGTACTCCCT CTCAAAAGCG GGCATGACTT CTGCGCTAAG
      ACAACCCCAC TCATGAGGGA GAGTTTTCGC CCGTACTGAA GACGCGATTC

      ----------------------------------------------------------

2451  ATTGTCAGTT TCCAAAAACG AGGAGGATTT GATATTCACC TGGCCCGCGG
      TAACAGTCAA AGGTTTTTGC TCCTCCTAAA CTATAAGTGG ACCGGGCGCC

      ----------------------------------------------------------

2501  TGATGCCTTT GAGGGTGGCC GCGTCCATCT GGTCAGAAAA GACAATCTTT
      ACTACGGAAA CTCCCACCGG CGCAGGTAGA CCAGTCTTTT CTGTTAGAAA

      ----------------------------------------------------------

                  HindIII
                  ~~~~~~~
2551  TTGTTGTCAA GCTTGAGGTG TGGCAGGCTT GAGATCTGGC CATACACTTG
      AACAACAGTT CGAACTCCAC ACCGTCCGAA CTCTAGACCG GTATGTGAAC

      ----------------------------------------------------------

2601  AGTGACAATG ACATCCACTT TGCCTTTCTC TCCACAGGTG TCCACTCCCA
      TCACTGTTAC TGTAGGTGAA ACGGAAAGAG AGGTGTCCAC AGGTGAGGGT

      ----------------------------------------------------------
```

Fig. 20-7

```
      PstI
      ~~~~~~
2651  GGTCCAACTG CAGGTCGATC GAGCATGCAT CTAGGGCGGC CAATTCGCCC
      CCAGGTTGAC GTCCAGCTAG CTCGTACGTA GATCCCGCCG GTTAAGCGGG

      ----------|----------|----------|----------|----------|----------|
2701  CTCTCCCTCC CCCCCCCCTA ACGTTACTGG CCGAAGCCGC TTGGAATAAG
      GAGAGGGAGG GGGGGGGGAT TGCAATGACC GGCTTCGGCG AACCTTATTC

      ----------|----------|----------|----------|----------|----------|
2751  GCCGGTGTGT GTTTGTCTAT ATGTGATTTT CCACCATATT GCCGTCTTTT
      CGGCCACACA CAAACAGATA TACACTAAAA GGTGGTATAA CGGCAGAAAA

      ----------|----------|----------|----------|----------|----------|
2801  GGCAATGTGA GGGCCCGGAA ACCTGGCCCT GTCTTCTTGA CGAGCATTCC
      CCGTTACACT CCCGGGCCTT TGGACCGGGA CAGAAGAACT GCTCGTAAGG

      ----------|----------|----------|----------|----------|----------|
2851  TAGGGGTCTT TCCCCTCTCG CCAAAGGAAT GCAAGGTCTG TTGAATGTCG
      ATCCCCAGAA AGGGGAGAGC GGTTTCCTTA CGTTCCAGAC AACTTACAGC

      ----------|----------|----------|----------|----------|----------|
                          HindIII
                          ~~~~~~~
2901  TGAAGGAAGC AGTTCCTCTG GAAGCTTCTT GAAGACAAAC AACGTCTGTA
      ACTTCCTTCG TCAAGGAGAC CTTCGAAGAA CTTCTGTTTG TTGCAGACAT

      ----------|----------|----------|----------|----------|----------|
2951  GCGACCCTTT GCAGGCAGCG GAACCCCCCA CCTGGCGACA GGTGCCTCTG
      CGCTGGGAAA CGTCCGTCGC CTTGGGGGGT GGACCGCTGT CCACGGAGAC

      ----------|----------|----------|----------|----------|----------|
3001  CGGCCAAAAG CCACGTGTAT AAGATACACC TGCAAAGGCG GCACAACCCC
      GCCGGTTTTC GGTGCACATA TTCTATGTGG ACGTTTCCGC CGTGTTGGGG

      ----------|----------|----------|----------|----------|----------|
3051  AGTGCCACGT TGTGAGTTGG ATAGTTGTGG AAAGAGTCAA ATGGCTCTCC
      TCACGGTGCA ACACTCAACC TATCAACACC TTTCTCAGTT TACCGAGAGG
```

Fig. 20-8

```
3101  TCAAGCGTAG TCAACAAGGG GCTGAAGGAT GCCCAGAAGG TACCCCATTG
      AGTTCGCATC AGTTGTTCCC CGACTTCCTA CGGGTCTTCC ATGGGGTAAC

                                  ApaLI
                                  ~~~~~~~
3151  TATGGGAATC TGATCTGGGG CCTCGGTGCA CATGCTTTAC ATGTGTTTAG
      ATACCCTTAG ACTAGACCCC GGAGCCACGT GTACGAAATG TACACAAATC

3201  TCGAGGTTAA AAAAGCTCTA GGCCCCCCGA ACCACGGGGA CGTGGTTTTC
      AGCTCCAATT TTTTCGAGAT CCGGGGGGCT TGGTGCCCCT GCACCAAAAG

                                        XmaI
                                        ~~~~~~
                                        SmaI
                                        ~~~~~~
                          HindIII       AvaI        PstI
                          ~~~~~~~       ~~~~~~      ~~~~
3251  CTTTGAAAAA CACGATGATA AGCTTGCCAC AACCCCGGGA TAATTCCTGC
      GAAACTTTTT GTGCTACTAT TCGAACGGTG TTGGGGCCCT ATTAAGGACG

      PstI
      ~~
3301  AGCCAATATG GGATCGGCCA TTGAACAAGA TGGATTGCAC GCAGGTTCTC
      TCGGTTATAC CCTAGCCGGT AACTTGTTCT ACCTAACGTG CGTCCAAGAG

3351  CGGCCGCTTG GGTGGAGAGG CTATTCGGCT ATGACTGGGC ACAACAGACA
      GCCGGCGAAC CCACCTCTCC GATAAGCCGA TACTGACCCG TGTTGTCTGT

3401  ATCGGCTGCT CTGATGCCGC CGTGTTCCGG CTGTCAGCGC AGGGGCGCCC
      TAGCCGACGA GACTACGGCG GCACAAGGCC GACAGTCGCG TCCCCGCGGG
```

Fig.20-9

```
                                    PstI
                                    ~~~~~~
3451  GGTTCTTTTTT GTCAAGACCG ACCTGTCCGG TGCCCTGAAT GAACTGCAGG
      CCAAGAAAAA CAGTTCTGGC TGGACAGGCC ACGGGACTTA CTTGACGTCC

-----------------------------------------------------------

3501  ACGAGGCAGC GCGGCTATCG TGGCTGGCCA CGACGGGCGT TCCTTGCGCA
      TGCTCCGTCG CGCCGATAGC ACCGACCGGT GCTGCCCGCA AGGAACGCGT

-----------------------------------------------------------

3551  GCTGTGCTCG ACGTTGTCAC TGAAGCGGGA AGGGACTGGC TGCTATTGGG
      CGACACGAGC TGCAACAGTG ACTTCGCCCT TCCCTGACCG ACGATAACCC

-----------------------------------------------------------

3601  CGAAGTGCCG GGGCAGGATC TCCTGTCATC TCACCTTGCT CCTGCCGAGA
      GCTTCACGGC CCCGTCCTAG AGGACAGTAG AGTGGAACGA GGACGGCTCT

-----------------------------------------------------------

3651  AAGTATCCAT CATGGCTGAT GCAATGCGGC GGCTGCATAC GCTTGATCCG
      TTCATAGGTA GTACCGACTA CGTTACGCCG CCGACGTATG CGAACTAGGC

-----------------------------------------------------------

3701  GCTACCTGCC CATTCGACCA CCAAGCGAAA CATCGCATCG AGCGAGCACG
      CGATGGACGG GTAAGCTGGT GGTTCGCTTT GTAGCGTAGC TCGCTCGTGC

-----------------------------------------------------------

3751  TACTCGGATG GAAGCCGGTC TTGTCGATCA GGATGATCTG GACGAAGAGC
      ATGAGCCTAC CTTCGGCCAG AACAGCTAGT CCTACTAGAC CTGCTTCTCG

-----------------------------------------------------------

3801  ATCAGGGGCT CGCGCCAGCC GAACTGTTCG CCAGGCTCAA GGCGCGCATG
      TAGTCCCCGA GCGCGGTCGG CTTGACAAGC GGTCCGAGTT CCGCGCGTAC

-----------------------------------------------------------
```

Fig.20-10

NcoI
~~~~~~

```
3851  CCCGACGGCG AGGATCTCGT CGTGACCCAT GGCGATGCCT GCTTGCCGAA
      GGGCTGCCGC TCCTAGAGCA GCACTGGGTA CCGCTACGGA CGAACGGCTT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

3901  TATCATGGTG GAAAATGGCC GCTTTTCTGG ATTCATCGAC TGTGGCCGGC
      ATAGTACCAC CTTTTACCGG CGAAAAGACC TAAGTAGCTG ACACCGGCCG

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

3951  TGGGTGTGGC GGACCGCTAT CAGGACATAG CGTTGGCTAC CCGTGATATT
      ACCCACACCG CCTGGCGATA GTCCTGTATC GCAACCGATG GGCACTATAA

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4001  GCTGAAGAGC TTGGCGGCGA ATGGGCTGAC CGCTTCCTCG TGCTTTACGG
      CGACTTCTCG AACCGCCGCT TACCCGACTG GCGAAGGAGC ACGAAATGCC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4051  TATCGCCGCT CCCGATTCGC AGCGCATCGC CTTCTATCGC CTTCTTGACG
      ATAGCGGCGA GGGCTAAGCG TCGCGTAGCG GAAGATAGCG GAAGAACTGC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4101  AGTTCTGGTC GAGGCGGATC TGATCAAGAG ACAGGATGAG GATCGTTTCG
      TCAAGACCAG CTCCGCCTAG ACTAGTTCTC TGTCCTACTC CTAGCAAAGC

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4151  CGCGGGACTC TGGGGTTCGA TAAAATAAAA GATTTTATTT AGTCTCCAGA
      GCGCCCTGAG ACCCCAAGCT ATTTTATTTT CTAAAATAAA TCAGAGGTCT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4201  AAAAGGGGGG AATGAAAGAC CCCACCTGTA GGTTTGGCAA GCTAGCTTAA
      TTTTCCCCCC TTACTTTCTG GGGTGGACAT CCAAACCGTT CGATCGAATT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------

4251  GTAACGCCAT TTTGCAAGGC ATGGAAAAAT ACATAACTGA GAATAGAGAA
      CATTGCGGTA AAACGTTCCG TACCTTTTTA TGTATTGACT CTTATCTCTT

      ----------|----------|----------|----------|----------|----------|----------|----------|----------|----------
```

Fig.20-11
~~~~~~

```
4301  GTTCAGATCA AGGTCAGGAA CAGATGGAAC AGCTGAATAT GGGCCAAACA
      CAAGTCTAGT TCCAGTCCTT GTCTACCTTG TCGACTTATA CCCGGTTTGT

      ----------|----------|----------|----------|----------

4351  GGATATCTGT GGTAAGCAGT TCCTGCCCCG GCTCAGGGCC AAGAACAGAT
      CCTATAGACA CCATTCGTCA AGGACGGGGC CGAGTCCCGG TTCTTGTCTA

      ----------|----------|----------|----------|----------

4401  GGAACAGCTG AATATGGGCC AAACAGGATA TCTGTGGTAA GCAGTTCCTG
      CCTTGTCGAC TTATACCCGG TTTGTCCTAT AGACACCATT CGTCAAGGAC

      ----------|----------|----------|----------|----------

4451  CCCCGGCTCA GGGCCAAGAA CAGATGGTCC CCAGATGCGG TCCAGCCCTC
      GGGGCCGAGT CCCGGTTCTT GTCTACCAGG GGTCTACGCC AGGTCGGGAG

      ----------|----------|----------|----------|----------

4501  AGCAGTTTCT AGAGAACCAT CAGATGTTTC CAGGGTGCCC CAAGGACCTG
      TCGTCAAAGA TCTCTTGGTA GTCTACAAAG GTCCCACGGG GTTCCTGGAC

      ----------|----------|----------|----------|----------

4551  AAATGACCCT GTGCCTTATT TGAACTAACC AATCAGTTCG CTTCTCGCTT
      TTTACTGGGA CACGGAATAA ACTTGATTGG TTAGTCAAGC GAAGAGCGAA

      ----------|----------|----------|----------|----------
                                AvaI
                                ------
4601  CTGTTCGCGC GCTTCTGCTC CCCGAGCTCA ATAAAAGAGC CCACAACCCC
      GACAAGCGCG CGAAGACGAG GGGCTCGAGT TATTTTCTCG GGTGTTGGGG

      ----------|----------|----------|----------|----------
```

Fig.20-12

```
                                                    XmaI
                                                    ~~~~~~
                                                     SmaI
                                                    ~~~~~~~
                                                     AvaI
                                                    ~~~~~~~
      AvaI
      ~~~~~
4651  TCACTCGGGG CGCCAGTCCT CCGATTGACT GAGTCGCCCG GGTACCCGTG
      AGTGAGCCCC GCGGTCAGGA GGCTAACTGA CTCAGCGGGC CCATGGGCAC

      ----------|----------|----------|----------|----------|----------|
4701  TATCCAATAA ACCCTCTTGC AGTTGCATCC GACTTGTGGT CTCGCTGTTC
      ATAGGTTATT TGGGAGAACG TCAACGTAGG CTGAACACCA GAGCGACAAG

      ----------|----------|----------|----------|----------|----------|
4751  CTTGGGAGGG TCTCCTCTGA GTGATTGACT ACCCGTCAGC GGGGGTCTTT
      GAACCCTCCC AGAGGAGACT CACTAACTGA TGGGCAGTCG CCCCCAGAAA

      ----------|----------|----------|----------|----------|----------|
4801  CATTTGGGGG CTCGTCCGGG ATCGGGAGAC CCCTGCCCAG GGACCACCGA
      GTAAACCCCC GAGCAGGCCC TAGCCCTCTG GGGACGGGTC CCTGGTGGCT

      ----------|----------|----------|----------|----------|----------|
4851  CCCACCACCG GGAGGTAAGC TGGCTGCCTC GCGCGTTTCG GTGATGACGG
      GGGTGGTGGC CCTCCATTCG ACCGACGGAG CGCGCAAAGC CACTACTGCC

      ----------|----------|----------|----------|----------|----------|
4901  TGAAAACCTC TGACACATGC AGCTCCCGGA GACGGTCACA GCTTGTCTGT
      ACTTTTGGAG ACTGTGTACG TCGAGGGCCT CTGCCAGTGT CGAACAGACA

      ----------|----------|----------|----------|----------|----------|
4951  AAGCGGATGC CGGGAGCAGA CAAGCCCGTC AGGGCGCGTC AGCGGGTGTT
      TTCGCCTACG GCCCTCGTCT GTTCGGGCAG TCCCGCGCAG TCGCCCACAA

      ----------|----------|----------|----------|----------|----------|
5001  GGCGGGTGTC GGGGCGCAGC CATGACCCAG TCACGTAGCG ATAGCGGAGT
      CCGCCCACAG CCCCGCGTCG GTACTGGGTC AGTGCATCGC TATCGCCTCA

      ----------|----------|----------|----------|----------|----------|
```

Fig. 20-13

```
                                                    ApaLI
                                                    ~~~~~
5051  GTATACTATGC TTAACTATGC GGCATCAGAG CAGATTGTAC TGAGAGTGCA
      CATATGACCG AATTGATACG CCGTAGTCTC GTCTAACATG ACTCTCACGT

      ----------|----------|----------|----------|----------|----------
          ApaLI
          ~
5101  CCATATGCGG TGTGAAATAC CGCACAGATG CGTAAGGAGA AAATACCGCA
      GGTATACGCC ACACTTTATG GCGTGTCTAC GCATTCCTCT TTTATGGCGT

      ----------|----------|----------|----------|----------|----------
5151  TCAGGCGCTC TTCCGCTTCC TCGCTCACTG ACTCGCTGCG CTCGGTCGTT
      AGTCCGCGAG AAGGCGAAGG AGCGAGTGAC TGAGCGACGC GAGCCAGCAA

      ----------|----------|----------|----------|----------|----------
5201  CGGCTGCGGC GAGCGGTATC AGCTCACTCA AAGGCGGTAA TACGGTTATC
      GCCGACGCCG CTCGCCATAG TCGAGTGAGT TTCCGCCATT ATGCCAATAG

      ----------|----------|----------|----------|----------|----------
5251  CACAGAATCA GGGGATAACG CAGGAAAGAA CATGTGAGCA AAAGGCCAGC
      GTGTCTTAGT CCCCTATTGC GTCCTTTCTT GTACACTCGT TTTCCGGTCG

      ----------|----------|----------|----------|----------|----------
5301  AAAAGGCCAG GAACCGTAAA AAGGCCGCGT TGCTGGCGTT TTTCCATAGG
      TTTTCCGGTC CTTGGCATTT TTCCGGCGCA ACGACCGCAA AAGGGTATCC

      ----------|----------|----------|----------|----------|----------
5351  CTCCGCCCCC CTGACGAGCA TCACAAAAAT CGACGCTCAA GTCAGAGGTG
      GAGGCGGGGG GACTGCTCGT AGTGTTTTTA GCTGCGAGTT CAGTCTCCAC

      ----------|----------|----------|----------|----------|----------
5401  GCGAAACCCG ACAGGACTAT AAAGATACCA GGCGTTTCCC CCTGGAAGCT
      CGCTTTGGGC TGTCCTGATA TTTCTATGGT CCGCAAAGGG GGACCTTCGA

      ----------|----------|----------|----------|----------|----------
```

Fig. 20-14

```
5451  CCCTCGTGCG CTCTCCTGTT CCGACCCTGC CGCTTACCGG ATACCTGTCC
      GGGAGCACGC GAGAGGACAA GGCTGGGACG GCGAATGGCC TATGGACAGG

      ----------|----------|----------|----------|----------|----------

5501  GCCTTTCTCC CTTCGGGAAG CGTGGCGCTT TCTCATAGCT CACGCTGTAG
      CGGAAAGAGG GAAGCCCTTC GCACCGCGAA AGAGTATCGA GTGCGACATC

      ----------|----------|----------|----------|----------|----------

                                  ApaLI
                                  ~~~~~~
5551  GTATCTCAGT TCGGTGTAGG TCGTTCGCTC CAAGCTGGGC TGTGTGCACG
      CATAGAGTCA AGCCACATCC AGCAAGCGAG GTTCGACCCG ACACACGTGC

      ----------|----------|----------|----------|----------|----------

5601  AACCCCCCGT TCAGCCCGAC CGCTGCGCCT TATCCGGTAA CTATCGTCTT
      TTGGGGGGCA AGTCGGGCTG GCGACGCGGA ATAGGCCATT GATAGCAGAA

      ----------|----------|----------|----------|----------|----------

5651  GAGTCCAACC CGGTAAGACA CGACTTATCG CCACTGGCAG CAGCCACTGG
      CTCAGGTTGG GCCATTCTGT GCTGAATAGC GGTGACCGTC GTCGGTGACC

      ----------|----------|----------|----------|----------|----------

5701  TAACAGGATT AGCAGAGCGA GGTATGTAGG CGGTGCTACA GAGTTCTTGA
      ATTGTCCTAA TCGTCTCGCT CCATACATCC GCCACGATGT CTCAAGAACT

      ----------|----------|----------|----------|----------|----------

5751  AGTGGTGGCC TAACTACGGC TACACTAGAA GGACAGTATT TGGTATCTGC
      TCACCACCGG ATTGATGCCG ATGTGATCTT CCTGTCATAA ACCATAGACG

      ----------|----------|----------|----------|----------|----------

5801  GCTCTGCTGA AGCCAGTTAC CTTCGGAAAA AGAGTTGGTA GCTCTTGATC
      CGAGACGACT TCGGTCAATG GAAGCCTTTT TCTCAACCAT CGAGAACTAG

      ----------|----------|----------|----------|----------|----------

5851  CGGCAAACAA ACCACCGCTG GTAGCGGTGG TTTTTTTGTT TGCAAGCAGC
      GCCGTTTGTT TGGTGGCGAC CATCGCCACC AAAAAACAA ACGTTCGTCG

      ----------|----------|----------|----------|----------|----------
```

Fig. 20-15

```
5901  AGATTACGCG CAGAAAAAAA GGATCTCAAG AAGATCCTTT GATCTTTTCT
      TCTAATGCGC GTCTTTTTTT CCTAGAGTTC TTCTAGGAAA CTAGAAAAGA

      ----------|----------|----------|----------|----------|----------

5951  ACGGGGTCTG ACGCTCAGTG GAACGAAAAC TCACGTTAAG GGATTTTGGT
      TGCCCCAGAC TGCGAGTCAC CTTGCTTTTG AGTGCAATTC CCTAAAACCA

      ----------|----------|----------|----------|----------|----------

6001  CATGAGATTA TCAAAAAGGA TCTTCACCTA GATCCTTTTA AATTAAAAAT
      GTACTCTAAT AGTTTTTCCT AGAAGTGGAT CTAGGAAAAT TTAATTTTTA

      ----------|----------|----------|----------|----------|----------

6051  GAAGTTTTAA ATCAATCTAA AGTATATATG AGTAAACTTG GTCTGACAGT
      CTTCAAAATT TAGTTAGATT TCATATATAC TCATTTGAAC CAGACTGTCA

      ----------|----------|----------|----------|----------|----------

6101  TACCAATGCT TAATCAGTGA GGCACCTATC TCAGCGATCT GTCTATTTCG
      ATGGTTACGA ATTAGTCACT CCGTGGATAG AGTCGCTAGA CAGATAAAGC

      ----------|----------|----------|----------|----------|----------

6151  TTCATCCATA GTTGCCTGAC TCCCCGTCGT GTAGATAACT ACGATACGGG
      AAGTAGGTAT CAACGGACTG AGGGGCAGCA CATCTATTGA TGCTATGCCC

      ----------|----------|----------|----------|----------|----------

6201  AGGGCTTACC ATCTGGCCCC AGTGCTGCAA TGATACCGCG AGACCCACGC
      TCCCGAATGG TAGACCGGGG TCACGACGTT ACTATGGCGC TCTGGGTGCG

      ----------|----------|----------|----------|----------|----------

6251  TCACCGGCTC CAGATTTATC AGCAATAAAC CAGCCAGCCG GAAGGGCCGA
      AGTGGCCGAG GTCTAAATAG TCGTTATTTG GTCGGTCGGC CTTCCCGGCT

      ----------|----------|----------|----------|----------|----------

6301  GCGCAGAAGT GGTCCTGCAA CTTTATCCGC CTCCATCCAG TCTATTAATT
      CGCGTCTTCA CCAGGACGTT GAAATAGGCG GAGGTAGGTC AGATAATTAA

      ----------|----------|----------|----------|----------|----------
```

Fig.20-16

```
6351  GTTGCCGGGA AGCTAGAGTA AGTAGTTCGC CAGTTAATAG TTTGCGCAAC
      CAACGGCCCT TCGATCTCAT TCATCAAGCG GTCAATTATC AAACGCGTTG

      ----------------------------------------------------------

                 PstI
                 ~~~~~~
6401  GTTGTTGCCA TTGCTGCAGG CATCGTGGTG TCACGCTCGT CGTTTGGTAT
      CAACAACGGT AACGACGTCC GTAGCACCAC AGTGCGAGCA GCAAACCATA

      ----------------------------------------------------------

6451  GGCTTCATTC AGCTCCGGTT CCCAACGATC AAGGCGAGTT ACATGATCCC
      CCGAAGTAAG TCGAGGCCAA GGGTTGCTAG TTCCGCTCAA TGTACTAGGG

      ----------------------------------------------------------

6501  CCATGTTGTG CAAAAAAGCG GTTAGCTCCT TCGGTCCTCC GATCGTTGTC
      GGTACAACAC GTTTTTTCGC CAATCGAGGA AGCCAGGAGG CTAGCAACAG

      ----------------------------------------------------------

6551  AGAAGTAAGT TGGCCGCAGT GTTATCACTC ATGGTTATGG CAGCACTGCA
      TCTTCATTCA ACCGGCGTCA CAATAGTGAG TACCAATACC GTCGTGACGT

      ----------------------------------------------------------

6601  TAATTCTCTT ACTGTCATGC CATCCGTAAG ATGCTTTTCT GTGACTGGTG
      ATTAAGAGAA TGACAGTACG GTAGGCATTC TACGAAAAGA CACTGACCAC

      ----------------------------------------------------------

6651  AGTACTCAAC CAAGTCATTC TGAGAATAGT GTATGCGGCG ACCGAGTTGC
      TCATGAGTTG GTTCAGTAAG ACTCTTATCA CATACGCCGC TGGCTCAACG

      ----------------------------------------------------------

6701  TCTTGCCCGG CGTCAACACG GGATAATACC GCGCCACATA GCAGAACTTT
      AGAACGGGCC GCAGTTGTGC CCTATTATGG CGCGGTGTAT CGTCTTGAAA

      ----------------------------------------------------------

6751  AAAAGTGCTC ATCATTGGAA AACGTTCTTC GGGGCGAAAA CTCTCAAGGA
      TTTTCACGAG TAGTAACCTT TTGCAAGAAG CCCCGCTTTT GAGAGTTCCT

      ----------------------------------------------------------
```

Fig.20-17

```
                ApaLI
                ~~~~~
6801  TCTTACCGCT GTTGAGATCC AGTTCGATGT AACCCACTCG TGCACCCAAC
      AGAATGGCGA CAACTCTAGG TCAAGCTACA TTGGGTGAGC ACGTGGGTTG

      ----------|----------|----------|----------|----------|----------
6851  TGATCTTCAG CATCTTTTAC TTTCACCAGC GTTTCTGGGT GAGCAAAAAC
      ACTAGAAGTC GTAGAAAATG AAAGTGGTCG CAAAGACCCA CTCGTTTTTG

      ----------|----------|----------|----------|----------|----------
6901  AGGAAGGCAA AATGCCGCAA AAAAGGGAAT AAGGGCGACA CGGAAATGTT
      TCCTTCCGTT TTACGGCGTT TTTTCCCTTA TTCCCGCTGT GCCTTTACAA

      ----------|----------|----------|----------|----------|----------
6951  GAATACTCAT ACTCTTCCTT TTTCAATATT ATTGAAGCAT TTATCAGGGT
      CTTATGAGTA TGAGAAGGAA AAAGTTATAA TAACTTCGTA AATAGTCCCA

      ----------|----------|----------|----------|----------|----------
7001  TATTGTCTCA TGAGCGGATA CATATTTGAA TGTATTTAGA AAAATAAACA
      ATAACAGAGT ACTCGCCTAT GTATAAACTT ACATAAATCT TTTTATTTGT

      ----------|----------|----------|----------|----------|----------
7051  AATAGGGGTT CCGCGCACAT TTCCCCGAAA AGTGCCACCT GACGTCTAAG
      TTATCCCCAA GGCGCGTGTA AAGGGGCTTT TCACGGTGGA CTGCAGATTC

      ----------|----------|----------|----------|----------|----------
7101  AAACCATTAT TATCATGACA TTAACCTATA AAAATAGGCG TATCACGAGG
      TTTGGTAATA ATAGTACTGT AATTGGATAT TTTTATCCGC ATAGTGCTCC

      ----------|----------|----------|----------|----------|----------
7151  CCCTTTCGTC TTCAA
      GGGAAAGCAG AAGTT

      ----------|----------|----------|----------|----------|----------
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Fig.20-18

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<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence : recombinant vector

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<212> DNA
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<220>
<223> Description of Artificial Sequence : recombinant vector

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INTERNATIONAL SEARCH REPORT

Inte. ational Application No
PCT/US 99/00733

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 C12N15/86 C12N15/34 C12N15/38 C12N5/10 A61K48/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 95 15384 A (JOHNSON DAVID C ;YORK IAN A (CA)) 8 June 1995 see page 11, line 20 - page 17, line 27 see page 30, line 22 - page 31, line 9 see page 49, line 7 - page 51, line 3	1-25
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[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
23 June 1999	06/07/1999

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax: (+31-70) 340-3016	Sitch, W

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

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Information on patent family members

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